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August 2020

Somerset Integrated Resource Project

Final Environmental Assessment

Green Mountain National Forest
Manchester Ranger District

Towns of Dover, Glastenbury, Searsburg, Somerset, Stratton, Sunderland, Wardsboro, Wilmington, and Woodford

Bennington and Windham Counties, Vermont

Shep's Meadow - Somerset, Vermont

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1. Need for the Proposal

1.1 Introduction

The United States Department of Agriculture Forest Service is proposing the Somerset Integrated Resource Project on the Green Mountain National Forest, Manchester Ranger District. The project is located within Bennington and Windham Counties, Vermont primarily within the towns of Dover, Glastenbury, Searsburg, Somerset, Stratton, Wilmington, and Woodford, but also includes small portions of Sunderland and Wardsboro. The Somerset Integrated Resource Project (Somerset project) includes a variety of proposed management activities to achieve multiple resource goals, objectives, and desired future conditions as provided by direction in the 2006 Green Mountain National Forest Land and Resource Management Plan, or Forest Plan.

1.1.1 Project Area

The Somerset project area consists of approximately 71,161 acres located in several sub-watersheds of the Deerfield River and Lye Brook-Batten Kill watersheds in south-central Vermont (see Figure 1, Project Vicinity Map; and Map 1, Existing Condition).

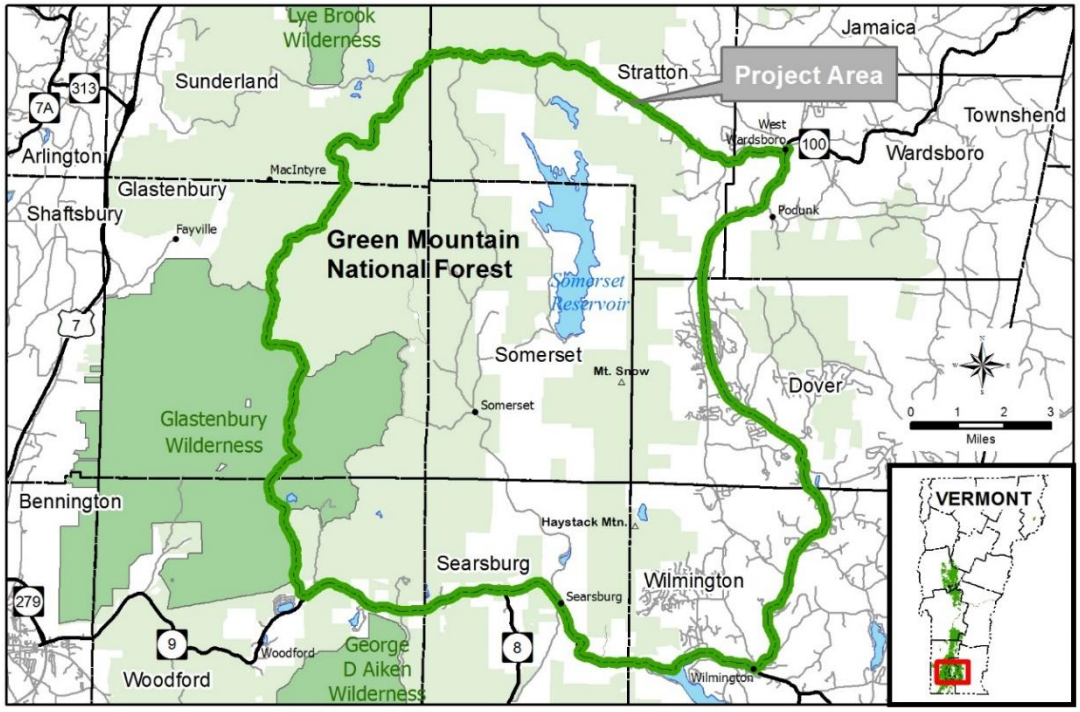

Figure 1. Project vicinity map

1.1.2 Land Ownership

The project area consists of multiple land ownership and management responsibilities including the Forest Service, State of Vermont, Towns, and private entities (see Table 1-1).

Table 1-1. Land ownership and management within the Somerset project area

Owner/Manager	Acres[1]	Percent of Total
USDA Forest Service	42,603	59.9
State of Vermont[2]	120	0.1
Town[3]	685	1.0
Land Trust[4]	9,809	13.8
Private	17,944	25.2
Total	***71,161***	***100***

[1] Approximate
[2] Woodford State Park and Billings Pond
[3] Deerfield Valley Elementary School Forest, Leland & Grey Union High School Forest, Stephen Greene Town Forest, and Town of Wilmington watershed and park
[4] Vermont Land Trust Easement (former TransCanada lands)

1.1.3 Forest Plan

The Somerset project is designed to be consistent with Forest Plan management direction including goals, objectives, and standards and guidelines for a balance of multiple uses to meet public needs while providing the framework to protect, restore, and enhance natural resources on National Forest System lands. Desired future condition of resources having different management emphasis is based on Forest Plan management area allocations. Table 1-2 and Map 1, Existing Condition display the management areas included within the Somerset project area.

Table 1-2. Management areas within the project area

Management Area	Acres[1]	Percent of Total
Diverse Forest Use	17,468	41
Diverse Backcountry	11,400	27
Remote Wildlife Habitat	6,142	14
Alpine Ski Area Expansion	422	1
Alpine Ski Areas	886	2
Appalachian National Scenic Trail	1,524	4
Ecological Special Area[2]	449	1
Wilderness[3]	4,312	10
Total	***42,603***	***100***
Eligible Wild, Scenic and Recreational Rivers[4]	4,836	n/a

[1] Approximate
[2] Grout Pond and Somerset Fen
[3] Glastenbury Wilderness
[4] Deerfield River and Wardsboro Brook are eligible recreational rivers; the Management Area applies to 1/4 mile each side of these rivers which overlays and runs through all other Management Areas, thus the acres are not reflected in the grand total.

1.1.4 National Environmental Policy Act Compliance

The Somerset project environmental assessment is compliant with the National Environmental Policy Act, or NEPA, as well as other relevant federal and state laws and regulations. The application of NEPA requires public participation and the disclosure of environmental effects of proposed management

activities. This site-specific environmental assessment is tiered (40 Code of Federal Regulations 1508.28) to the Final Environmental Impact Statement and Record of Decision for the Forest Plan (USDA Forest Service 2006b and 2006c). The relevant information and analysis in those documents applying to the Somerset project environmental assessment is incorporated by reference. Additional documentation, including references used for the analysis, may be found in the Somerset project planning record.

1.1.5 Pre-decisional Objection Process

The Somerset project would implement the Forest Plan and thus is subject to subparts A and B under the 36 Code of Federal Regulations part 218. These regulations provide for a project level pre-decisional administrative review (objection) process. In order to be eligible to submit an objection to the project draft decision notice prior to implementation, timely submittal of specific written comments during the designated public comment period is required. The following opportunities for the public to submit written comments for the Somerset project include:

1. *30-day Proposed Action and Opportunity to Comment*: Comments submitted during the formal 30-day notice and comment period for the Somerset project proposed action from March 29 through April 29, 2019. This 30-day period was initiated with the publication of a legal notice in the Green Mountain National Forest newspaper of record, the Rutland Herald.
2. *Environmental Assessment Comment Period*: Comments submitted during the comment period for the Somerset project environmental assessment from February 14 through March 23, 2020.

1.1.6 Responsible Official

The District Ranger for the Manchester Ranger District is the Responsible Official for the following decisions based on the Somerset project environmental assessment:

- Whether there are significant environmental effects warranting the preparation of an environmental impact statement; or whether there is a Finding of No Significant Impact (FONSI)
- If a FONSI is determined,
    - What management activities will be implemented
    - What mitigation measures are needed to keep environmental effects below thresholds of significance

1.2 Forest Plan Direction

The Forest Plan goals, objectives, and management direction for the desired future condition of resources are the primary drivers defining the need for the Somerset project proposed action. The following sections provide the gap between existing and desired conditions for each resource within the Somerset project area. Each resource gap is the basis used when considering the management activities needed to move the overall existing resource conditions closer to those desired by the Forest Plan across the forest landscape (USDA Forest Service 2018a).

1.2.1 Forest Habitat

Managing forest habitat for diversity is important to improve and maintain forest health. Diversity of habitat is critical to many wildlife species found across the project area. Forest Plan Goal 2 is to maintain and restore quality, amount, and distribution of habitats to produce viable and sustainable populations of native and desirable non-native plants and animals (Forest Plan, page 10). In order to contribute to this goal, the Forest Plan identifies forest habitat type composition and age class objectives to ensure diversity of composition, structure, and function is maintained or increased on the Green Mountain National Forest (Forest Plan, pages 10 to 12). While some of the composition and age class objectives can be met through natural processes, vegetation management is often used to restore and enhance diversity of habitat types

and structure (Forest Plan, page 15). Vegetation management is also used to enhance habitats and features of particular value to certain plant and animal species where habitat is uncommon in the forest, such as aspen, birch, and upland openings.

A habitat management unit analysis completed for the Somerset project area applies Forest Plan habitat type composition and age class objectives at the site-specific scale. Habitat management unit objectives are based on numerous ecological factors found in the project area, and reflect the vegetation composition and structure that would occur under natural conditions (USDA Forest Service 2018a). Tables 1-3 and 1-4 provide a summary of the existing forest habitat composition and age class distribution on National Forest System (NFS) lands within the project area compared to habitat management unit objectives. The difference between existing forest habitat conditions compared with desired objectives is the basis for identifying potential management activities to provide for a more diverse, healthy and resilient forest ecosystem within the project area.

For the project area, the ability to implement vegetation treatments is primarily limited to habitat within management areas where suitable lands for timber management are located including the Diverse Forest Use, Diverse Backcountry, and Remote Wildlife Habitat Management Areas (Forest Plan, page 11). Forest habitat composition objectives include all National Forest System lands while age class objectives only include suitable lands.

Table 1-3: Comparison of important existing habitat composition conditions with Habitat Management Unit objective ranges within the Somerset project area (the difference helps identify management activities to move existing forest conditions closer to desired objectives)

Habitat Type[1]	HMU Objective (all NFS lands)		Existing Habitats (all NFS lands)		Existing Habitats (suitable lands)[2]	
	acres	*percent*	*acres*	*percent*	*acres*	*percent*[3]
Northern Hardwood	4,160 - 8,320	10 - 20	32,952	79	24,006	58
Mixedwood	24,950 - 29,100	60 - 70	3,796	9	3,207	8
Softwoods (spruce/ fir and softwood plantation)	4,160 - 6,240	10 - 15	2,267	5	1,613	4
Aspen/Birch	415 - 830	1-2	770	2	339	1
Open Uplands	415 - 830	1-2	422	1	176	<1
Totals			**40,207**	**100**	**29,341**	

[1] Wetland habitats are excluded from the list of habitats presented here as they currently meet the desired future condition for composition in the project area.

[2] Represents habitat type abundance for all National Forest System (NFS) lands in the Somerset project area suitable for timber management; shown for context, as some habitat types (such as Aspen/Birch and Upland Openings) require active vegetation management to exist at the levels defined by the Forest Plan and project specific objectives.

[3] Percent of all NFS acres that are suitable acres of this habitat type.

Table 1-4: Comparison of the existing age class distribution on all National Forest System lands and on suitable lands only with Habitat Management Unit objective ranges within the Somerset project area (the difference helps identify management activities to move forest conditions closer to desired objectives)

Age Class (Includes All Forested Habitat Types)	Existing Condition (all NFS lands)[1]		Existing Condition (suitable lands)[2]		HMU Objective[3]
	acres	*percent*	*acres*	*percent*	*acres*
Regenerating (0 to 9 years)	0	0	0	0	1,172 - 3,298
Young	3,517	9	2,653	9	4,254 – 9,814
Mature	20,843	51	18,396	62	8,140 – 12,555
Old	16,213	40	8,646	29	1,158 – 8,765

[1] Condition across all forested National Forest System (NFS) lands within the Somerset project area.

[2] Applies only to NFS lands suitable for timber management and assigned to an even-aged management status prior to project development.

[3] Acre range represents potential natural vegetation of suitable National Forest System (NFS) lands assigned to an even-aged management status (60 to 80 percent of suitable lands), adjusted for conversions to or maintenance of existing aspen, birch, and openings.

The following narrative highlights the need for action to move the existing habitat composition and age class toward desired objectives within the Somerset project area.

Hardwood/Mixed-wood/Softwood Habitat

There is a need to address the substantial project area imbalance in the existing proportion of northern hardwood, mixed-wood, and softwood habitat types compared to desired habitat composition objectives (see Table 1-3). Northern hardwoods dominate forested stands, while mixed-wood and softwood habitats are substantially under-represented. Enhancement of softwood seedlings, saplings, and small poles in areas with tendencies to move toward softwoods is needed to increase habitat diversity and help restore a more ecologically appropriate forest composition. Shifts in composition predicted as a result of climate change indicate conversion to mixed-wood and softwood stands should focus on sites with abundant and vigorous softwood regeneration, and sites which are cool, moist, or are otherwise topographically protected such as low areas, frost pockets, wetland edges, and deep draws and ravines.

Aspen and Birch Habitat

There is a need to regenerate aspen and birch habitat on lands suitable for timber management within the project area. Although existing aspen and birch are present at levels within the 1 to 2 percent habitat objective (770 acres or 2 percent), only 339 acres or 44 percent of the total occur where stands can be managed. Without active management, aspen and birch habitat within the project area would decline and eventually fall below desired objectives.

Both aspen and birch habitats are early successional forest types and cannot occur without a large disturbance event to expose mineral soil and provide abundant light. Additionally, aspen-birch habitats are short-lived and their continuing presence on the landscape is dependent on vegetation management activities preventing succession to longer-lived habitats like mixed-wood and softwood types. Aspen sprouts from its roots when cut and is the most common way for species regeneration. As aspen dies, opportunities to regenerate it by root sprouting are lost.

Oak Habitat

There is a need to increase oak habitat at sites where conditions would support its growth. Northern red oak is limited to a few stands within the project area. Oak requires frequent disturbance (such as fire or past cutting practices) to establish seedlings and out-compete other tree regeneration. Silvicultural treatments can replicate the disturbance process to promote oak regeneration and subsequent growth into the forest canopy. Increasing the occurrence of northern red oak in areas where it has a high chance of

survival under current climate conditions would increase resilience of the project area to future climate conditions.

Non-Native Softwood Plantations

There is a need to convert existing non-native red pine and Norway spruce plantations to native species. There are approximately 20 acres of non-native softwood plantations including red pine and Norway spruce in the project area. These plantations, while historically established to stabilize soils, should be restored to forest habitat types naturally adapted to the project area landscape. All plantation stands within the project area are considered mature and could be regenerated or thinned to allow conversion to native species.

Early Successional Habitat

Temporary Openings (Regenerating Age Class)

There is a need to create temporary openings to increase the amount of the regenerating age class (0 to 9 years old) across all forested habitats suitable for management. Currently, there are no stands in the regenerating age class of at least an acre in size within the project area where desired objectives range from 1,172 to 3,298 acres (see Table 1-4). Early successional habitat represents an extremely important component of wildlife habitat. Various timber harvesting methods can create temporary openings in the forest canopy providing early successional habitat for up to 20 years which is important to many wildlife species. It also contributes to the vertical and horizontal structure across the overall forest landscape.

Permanent Upland Openings

There is a need to increase the amount of permanent upland openings and maintain this habitat type within the project area. Currently, less than one percent of lands (422 acres) provide permanent upland opening habitat within the project area where desired objectives range from one to two percent, or 415 to 830 acres (see Table 1-3). Contrasting with temporary openings created by timber harvests, permanent openings offer important wildlife habitat over the long-term through a wide range of vegetative conditions from grass-forb meadows to openings with young, shrub-scrub, woody vegetation. It also provides higher quality habitat for pollinators.

Apple Trees

Apple trees need to be released and pruned for wildlife food production and retained as historical features of the Green Mountain National Forest (Forest Plan, pages 27 and 29). Apple trees are located at numerous sites in the project area typically as single trees, small groups of trees, or occasionally orchards that are remnant from historical home sites. As the forest matures, other tree species encroach and shade apple trees which become less productive in the reduced light of the understory and eventually die. Removal of over-topping trees immediately around the apples invigorates their growth and promotes fruit production. Occasional pruning of these apple trees also redirects production from vegetative growth to production of fruit.

1.2.2 Timber Resource

There is a need to harvest timber to achieve Forest Plan objectives for creating and maintaining healthy, productive forests, and quality habitats (Forest Plan, page 15). Timber harvesting also provides high-quality sawtimber and other timber products on a sustained yield basis (Forest Plan, page 14 and 47) and supports regional and local economies through resource use, production, and protection (Forest Plan, page 17). A wide range of even-aged and uneven-aged silvicultural harvest methods are available to achieve these objectives. Forest inventories show a number of timber stands in the project area are overstocked with trees. Many other stands have trees with low stocking, poor form, declining vigor, insect, disease, or physical damage from weather events to such a degree classifying them as low quality stands.

In particular, many stands have high stocking of shade-tolerant beech saplings in the understory affected by beech bark disease. When the overstory trees die, the trajectory of these stands is toward a stunted forest of beech saplings dying from beech bark disease before growing very large or producing beech nuts. Silvicultural treatments can decrease the amount of beech regeneration by increasing the amount of light to the forest floor which gives an advantage to regeneration of other species such as birches, black cherry, and red maple.

1.2.3 Fisheries and Water

There is a need to add large wood in streams to help maintain and restore aquatic, fisheries, and riparian habitats (Forest Plan, page 13). Principles of stream geomorphology and habitat management are used to restore and enhance fisheries habitat while knowledge of riparian/floodplain functions and large wood dynamics are used to restore and enhance stream ecosystem processes.

A majority of stream habitat within the project area lacks the quantities of large wood which would naturally be found in upland streams (see Photo 1). Large wood in streams is critical to create diverse stream habitats for fish, amphibians, and aquatic insects.

Additionally, channel stability, stream function, and related riparian health along the Deerfield River are not at desired levels to provide for optimum aquatic habitat conditions.

Photo 1. East Branch Deerfield River devoid of large wood habitat
Photo Credit: Scott Wixsom

Last, there is a need to provide free passage of aquatic species along streams where existing road or trail culverts block their migration. Free passage for native brook trout and other aquatic species within streams which cross roads or trails is important to improve habitat connectivity.

1.2.4 Soil and Wetlands

There is a need to improve soil productivity and restore wetland functions where degradation of these resources is occurring. Forest Plan goals include maintaining or restoring the natural and ecological functions of the soil and wetland habitats (Forest Plan, page 13). Important ecological soil functions include regulating nutrient and water cycles such as water flow, energy transfer, nutrient uptake and release, and carbon transfer processes. The existing soil and wetland conditions show undesirable effects of acid deposition, presence of invasive earthworms, and erosion from non-system roads and trails.

1.2.5 Recreation

There is a need to improve the overall recreation resource within the project area to provide a full range of diverse recreation opportunities. Forest Plan Goal 12 is to provide a diverse range of high quality, sustainable recreation opportunities which complement those provided off National Forest System lands (Forest Plan, page 15). Recreation resources within the project area include trails, developed recreation sites (such as campgrounds, shelters, and trail heads), and dispersed recreation activities (see Map 1, Existing Condition).

Trails

The project area has a total of approximately 110 miles of existing trails (see Appendix C). Table 1-3 provides trails by managed use.

Table 1-3. Existing trails by managed use

Managed Use	Miles
Snowmobile	70.2
Bike	44.7
Hike	54.7
Horse	44.7
Cross Country Ski	41.8
Snowshoe	0
Fat Bike	0
All Trails	**109.4[1]**

[1] Total trail mileage is not a sum of all managed use miles as some trails offer multiple uses

Currently, there are limited opportunities for specific trail uses such as mountain biking, and demand for additional backcountry ski/snowboard access is high. At the same time, some existing trails no longer serve their intended purpose or located where resource damage may occur, and maintenance costs are too high to adequately sustain them. A comprehensive trail strategy (USDA Forest Service 2015a) provides guidance and recommendations for the sustainable management of non-motorized and motorized trails across National Forest lands including the project area. The strategy includes recommendations for future actions related to decommissioning, adding, or altering the management of trails.

Grout Pond Campground

Grout Pond Campground is a popular recreation site located in the project area. There is a need to improve the existing campground infrastructure to address ongoing resource degradation and enhance the recreation experience for the public using this site.

Some campsites and the boat launch along the Grout Pond shoreline are heavily eroded causing water quality concerns (see Photo 2). The lack of sufficient toilet facilities and inadequate human waste disposal is also a threat to water quality.

Photo 2. Soil impacts within a campsite along the Grout Pond shoreline

Photo credit: Emily Lauderdale

Existing parking and campsite capacity, and site access are inadequate to meet current user demand. Cars are often forced to park along the main road, and the narrow access roads and dead ends create a health and safety concern associated with inadequate emergency vehicle access and vehicle collisions. Campsite fixtures such as tent pads, picnic tables and fire rings are also in need of replacement or repair.

1.2.6 Visual Quality

There is a need to provide new vistas and maintain existing vistas especially along the Appalachian Trail/Long Trail. One of the most popular public activities on the Green Mountain National Forest is viewing scenery provided by established vistas (see Photo 3). Forest Plan Goal 15 is to maintain or enhance visual resources such as viewsheds, vistas, overlooks, and special features (Forest Plan, page 16).

Photo 3. View from existing vista on Haystack Mountain

Photo Credit: Melissa Reichert

1.2.7 Transportation (Roads and Infrastructure)

There is a need to improve the transportation system within the project area to provide a safe, efficient, and effective Forest transportation system meeting the needs of the public and the Forest Service (Forest Plan, page 16). The transportation system provides access for public and administrative uses. The system can also have negative effects on the natural and cultural resources of the Forest. There are approximately 39 miles of existing system roads within the Somerset project area under Forest Service jurisdiction with different operational use levels (see Table 1-4; and Appendix D).

A forest-wide detailed travel analysis (USDA Forest Service 2015b) recommends a minimum road system needed for safe and efficient travel and for administration, utilization, and protection of the National Forest System lands including the project area. This includes a road system which meets public access and management needs in a sustainable manner by reconstructing and maintaining existing roads where needed, decommissioning roads where they are no longer needed, and installation of gates to control road access during closure periods.

Table 1-4. Existing system roads by managed use

Operational Maintenance Level	Miles
1 – Basic Custodial Care (Closed)	17.70
2 – High Clearance Vehicles	10.26
3 – Suitable for Passenger Vehicles	2.37
4 – Moderate Degree of User Comfort	8.69
5 – High Degree of User Comfort	0.0
Total	**39.02**

1.2.8 Heritage Resources

There is a need to provide protection for heritage resource sites while increasing their visibility and stability within the project area through coordinated management activities. Forest Plan Goal 16 is to provide protection and stewardship for significant heritage resources on the Green Mountain National Forest (Forest Plan, page 17).

1.3 Public Involvement and Collaboration

Forest Service staff began collecting Somerset project area inventory data and conducted resource condition field reviews in early 2017. Existing resource conditions compared to Forest Plan desired future conditions were documented in the Somerset Integrated Resource Project Landscape Assessment (USDA Forest Service 2018a).

Potential project management activities to move the project area toward desired future conditions were shared at a May 2, 2018 public open house at Stratton Mountain Resort in Stratton, Vermont. Over 40 people participated by sharing information and feedback received was used to further develop proposed activities. Multiple conversations, field visits, and meetings with individuals and groups occurred throughout 2018 to better identify public needs and opportunities for management within the project area. Public input and further field inventory resulted in the Somerset project proposed action completed in early 2019.

Formal public involvement for the Somerset project was initiated by the legal notice published in the Rutland Herald on March 29, 2019 for the *Somerset Integrated Resource Project: Notice of Proposed Action and Opportunity to Comment* scoping document (USDA Forest Service 2019). The legal notice announced a 30-day public comment period ending April 29, 2019. An email notice for the availability of the scoping document was simultaneously distributed to 319 individuals, organizations, towns and agencies, and was also posted on the Green Mountain National Forest website at: http://www.fs.usda.gov/project/?project=53706.

The project was also listed in the *Green Mountain National Forest Schedule of Proposed Actions* beginning in April 2018 and updated quarterly with the project status since that time.

During the 30-day public comment period, a public open house meeting attended by approximately 30 individuals was held in Manchester, Vermont on April 11, 2019. The purpose of the meeting was to share information about the project proposed action, answer questions, and provide direction on how to submit comments.

The Forest Service received 120 individual comment responses to the March 2019 scoping document.

An additional opportunity for public comment was initiated with the distribution of the *February 2020 Somerset Integrated Resource Project Environmental Assessment* (USDA Forest Service 2020a) on February 13, 2020 for a comment period ending March 23, 2020. An email notice for the availability of the Somerset project environmental assessment was distributed to 442 individuals, organizations, towns and agencies, and was also posted on the Green Mountain National Forest website. The Forest Service received 76 individual comment responses to the February 2020 Somerset project environmental assessment.

Public comments together with resource inventory and field review conducted by Forest Service staff is the basis for the analysis of resource effects documented in the Somerset project environmental assessment.

1.4 Issues

An issue is defined as a concern regarding anticipated resource effects from implementing the proposed action. Issues help determine the focus and detail of environmental impacts to disclose in the environmental assessment.

Forest Service staff reviewed all March 2019 scoping and February 2020 Somerset project environmental assessment comments and identified relevant issues of resource concern. The *Somerset Integrated Resource Project Scoping Comments - Content Analysis and Response to Comments* (USDA Forest Service 2020b) and *Somerset Integrated Resource Project February 2020 Environmental Assessment Comments – Content Analysis and Consideration of Comments* (USDA Forest Service 2020c) reports document how public comments and associated issues were addressed during the Somerset project analysis process.

1.4.1 Issue Categories

For purposes of preparing the Somerset project environmental assessment, issues derived from public comments have been separated into the following three categories:

1. *Alternative to the proposed action.* These issues indicate a need to consider an alternative to address resource concerns. Alternatives, when developed in detail, display a clear difference in environmental effects associated with the issue.

2. *Topics of public interest.* These issues are important because they indicate a public desire for disclosure of effects relative to resource concerns.

3. *Required by law, regulation or policy.* Disclosure of effects associated with the proposed action are often needed to determine compliance with law, regulation or policy.

The following relevant issues were identified from public comments in response to the Somerset project proposed action and February 2020 environmental analysis. An issue statement was developed for each issue to provide a clear relationship between the cause and potential effect for the resource of concern. Issue 1 was used to develop an alternative for detailed analysis. All issues are addressed with a level of analysis for each relevant resource in the environmental assessment commensurate with the potential magnitude of their associated effects (see Chapter 3).

1. *Road construction could:*
   - Impact water quality
   - Cause soil compaction and erosion
   - Introduce and spread non-native invasive plants
2. *Land clearing and creation of a permanent upland opening near the intersection of Forest Road 71 and Somerset Road (Compartment 102/Stand 10) could:*
   - Destabilize the temperature of the Deerfield River
   - Cause soil erosion
   - Spread non-native invasive plants
3. *Timber harvest activities could:*
   - Impact important ecological values associated with old forests
   - Impact bear and deer wintering habitat
   - Harm birds protected by the Migratory Bird Treaty Act
   - Impact water quality in streams including those classified as A(1) streams
   - Degrade soil productivity
4. *Reduce the forest's ability to sequester carbon*
   - Introduce and spread non-native invasive plants
   - Decrease the quality of the snowmobile recreation experience
   - Decrease the quality of the Catamount Trail backcountry experience
   - Impact values associated with eligible scenic or recreational streams
5. *The Backcountry Recreation Area could:*
   - Degrade the Cold Brook watershed from bike and hiking trail construction and use
   - Cause soil instability and erosion from mountain bike use
   - Impact remote wildlife habitat from the trail along Deerfield Ridge
   - Impact wildlife population viability from mountain bike misuse and human activity
   - Impact habitat connectivity and the integrity of habitat features from backcountry ski zone development and use
   - Impact the ecological value of the montane spruce forest and montane yellow birch-red spruce forest high quality natural areas
   - Increase safety risks to recreation users because of the inability to access the site by first responders
6. *The Handle Road parking and trailhead could:*
   - Impact water quality from runoff affecting adjacent land at Bears Crossing
   - Cause soil erosion affecting adjacent land at Bears Crossing

7. *The decommissioning of snowmobile trails could:*
   - Decrease the snowmobile recreation experience
   - Impact the local economy dependent on snowmobile use in the area
8. *The use of glyphosate products could:*
   - Create a risk to humans
9. *Management activities could:*
   - Impact American marten
   - Impact threatened, endangered or sensitive wildlife species
   - Impact heritage sites

1.4.2 Non-Issues

Non-issues are derived from comments that do not readily lead to an issue. In some instances, non-issues are addressed with some discussion in the environmental assessment.

2. Proposed Action and Alternatives

This chapter includes descriptions of the following alternatives analyzed in detail as part of this environmental assessment:

- Alternative A: No Action
- Alternative B: Proposed Action
- Alternative C: Reduced Roads

2.1 Alternative A: No Action

Alternative A provides a baseline for comparing the environmental effects of the Proposed Action. There would be no implementation of any of the management activities proposed in Alternative B. Management activities previously approved within the project area would still be implemented. Other ongoing routine management activities associated with existing infrastructure would also continue such as road and trail maintenance.

2.2 Alternative B: Proposed Action

Alternative B consists of management activities developed to meet the need for the Somerset project proposal as described in Chapter 1. Some modifications have been made to address public comments received during the 30-day public comment period for the March 2019 scoping and Somerset project environmental assessment documents (USDA Forest Service 2019a, USDA Forest Service 2020a) and additional Forest Service specialist review of the management activities originally proposed.

The proposed action modifications include:

- Dropping the proposed group selection harvest treatment and associated log landing in Compartment 100/Stand 20 (56 acres)
- Changing the proposed harvest treatment for Compartment 108/Stand 23 (22 acres) from single tree to shelterwood harvest treatment method
- Dropping the proposed maintenance of the existing permanent upland opening located in Compartment 176/Stand 104 (49 acres) and Compartment 110/Stand 119 (4 acres)
- Adding placement of large wood in Black Brook (1.0 mile) and the upper East Branch of the Deerfield River (1.2 miles)
- Adding the removal of mature pine in Compartment 102/Stand 107 (4 acres) for sources of large wood placement
- Adding the improvement of 8.5 miles to the existing Glastenbury Trail (Forest Trail 375) for snowmobile use
- Adding restoration and maintenance of the Somerset Schoolhouse listed on the National Register of Historic Places

There also have been minor changes to various treatment acres resulting from field inventory and map corrections to reflect site specific ground conditions. This section provides the description of proposed management activities defining the proposed action to address the need for each resource within the Somerset project area (all acres are approximate). Table 2-11 at the end of Chapter 2 provides a summary of the proposed action.

A series of maps associated with the project provide the location of proposed activities and include:

- **Map 1, Existing Condition** displays the project area boundary, Forest Plan management areas, and road, trail, and other infrastructure as they currently exist
- **Maps 2a, 2b, 2c, and 2d, Alternative B Vegetation and Wildlife Habitat Management Activities** display the proposed vegetation and wildlife treatment activities
- **Map 3, Alternative B Recreation, Transportation, Soil & Watershed Activities** displays the proposed recreation, transportation (including road and trail projects), aquatic, soil and heritage activities

2.2.1 Forest Habitat and Timber Resources

The Forest Habitat and Timber Resources have been combined into one section because of their interconnected relationship.

Timber Harvest Treatments

The proposal includes timber harvest treatments on a total of 9,544 acres including uneven-aged and even-aged harvests using a variety of silvicultural methods and land clearing to create permanent upland openings (see Table 2-11; Appendix A2, Table A2-1, and Appendix A3, Table A3-1; and Maps 2a-2d, Alternative B Vegetation and Wildlife Habitat Management Activities). These treatments would provide forest products to local and regional economies, improve forest health and diversity, and move existing forest habitat composition and age classes toward the objectives outlined in the Forest Plan.

Proposed timber harvest treatment methods include (see Table 2-1):

- 5,689 acres of uneven-aged harvest treatments including single tree selection on 344 acres and group selection on 5,525 acres (both group selection and group selection with improvement)
- 3,609 acres of even-aged harvest treatments including regeneration cuts on 2,850 acres (shelterwood and clearcuts) and intermediate cuts on 759 acres (thinning and improvement cuts)
- 246 acres of land clearing to create permanent upland openings for shrub/grass habitat followed by clearing of undesirable sub-merchantable stems

Table 2-1: Description of proposed timber harvest treatment methods

Harvest Treatment Method	Description	Example Photograph
Clearcut with reserves	Creates a temporary opening of greater than five acres. At least five percent of each stand would be reserved from harvest to provide wildlife trees and greater structural diversity.	

Harvest Treatment Method	Description	Example Photograph
Patch cuts	Creates a temporary three to five acre opening. Trees with high wildlife value, such as those with cavities or exfoliating bark, can be reserved from harvest.	
Shelterwood	A portion of the existing overstory is retained to provide regeneration shelter, allow vigorous young trees to continue growing, and/or provide greater forest structure. Trees with high wildlife value are also retained individually or in clumps.	
Group selection	Group openings are created throughout a stand ranging in size from one to two acres in order to provide early successional benefits. Group openings are scattered throughout the stand to equal 10 to 20 percent of the total stand acres.	
Intermediate	Intermediate cuts include thinning and improvement cutting. It consists of removing trees from a stand sometime between the beginning or formation of the stand and regeneration cut. The primary objective is to remove unhealthy and poorly formed trees and provide retained trees better growing conditions.	

Photo Credits: Clearcut with reserves and group selection courtesy of Scott Wixsom, USDA Forest Service;
Patch cuts, shelterwood, and intermediate cuts courtesy of Brian Lockhart, USDA Forest Service, Bugwood.org

The timber harvest activities would be implemented with multiple commercial timber sales of various sizes implemented over a seven to ten-year period. Ground-based logging systems would be used for felling and skidding of trees in all stands. Skidders may use grapples or cables.

Timber harvesting would yield an estimated 42,000 hundred cubic feet or 25 million board feet of sawtimber and pulpwood. The breakdown of wood products is about 17,000 hundred cubic feet or 10 million board feet of sawtimber; and 25,000 hundred cubic feet or 32,000 cords of pulpwood.

Timber Stand Improvement

The proposal includes timber stand improvement (pre-commercial thinning) on 413 acres to improve the composition, structure, condition, health, and growth on young (less than 35 years old) even-aged stands (see Table 2-11; Appendix A2, Table A2-2; and Maps 2a-2d, Alternative B Vegetation and Wildlife Habitat Management Activities). This activity would be performed with mechanized hand equipment such as a chainsaw or brush saw.

Timber stand improvement treatments include:

- Retaining desired species crop trees on a spacing of approximately 16 feet by 16 feet
- Cutting less desirable competing trees touching the crowns of the crop trees allowing for improved crop tree growing conditions

Transportation Network

A comprehensive road system was designed as part of timber harvest planning to determine areas where log landings, skid routes, and other transportation infrastructure may be established to implement timber harvest activities (see Maps 2a-2d, Alternative B Vegetation and Wildlife Habitat Management Activities; and Map 3, Recreation, Transportation, Soil & Watershed Activities). The existing National Forest, town, and state road systems would be used for log truck access and logging equipment access to log landings.

The following road infrastructure activities are proposed to facilitate harvest activities:

- Construction of temporary roads and any improvement and/or maintenance needs associated with the existing transportation network to support timber harvest activities; details are provided in the Transportation Section (see Section 2.2.6 Transportation (Roads and Infrastructure)
- The use of two existing log landings from previous timber harvest activities
- Construction of an estimated 134 new log landings as well as skid roads/trails in locations needed to access all areas being considered for harvest (see Photo 4):
    - Landings are typically between one-quarter and one-half acre in size
    - Specific locations for new landings and skid roads/skid trails would be mutually agreed to by the timber sale(s) purchaser and Forest Service staff

Photo 4. Skidding timber on a skid trail
Photo Credit: Scott Wixsom

Post-Harvest Activities

The following activities are proposed as connected actions after completion of initial timber harvest treatments to address forest habitat and timber resource needs:

Site Preparation for Natural or Artificial Regeneration

The proposal includes 4,264 acres of site preparation to provide for natural or artificial regeneration of stands proposed for harvest using clearcuts, shelterwood, single tree selection, group selection, and group selection with improvement methods[1]. Site preparation would be implemented within one year following stand harvest. Treatment activities include:

- Cutting one to six-inch diameter saplings at breast height with hand tools to eliminate or reduce competition from residual vegetation
- Cutting bent or broken, not commercially valuable, or less desirable vegetation

Site Preparation/Release Treatments for Oak Regeneration

The proposal includes 221 acres of site preparation and/or release treatments for proposed oak regeneration planting. Site preparation would be implemented within one year following the harvest of the stand.

Cut-stump application of herbicide (glyphosate product) would be the preferred method for controlling competing tree seedlings/saplings (primarily, but not limited to, beech and red maple) to ensure success of planted oak seedlings. This method includes:

- Cutting undesirable saplings
- Painting or spraying stumps with herbicide to prevent stump or root sprouting

A glyphosate product has been selected based on its effectiveness and low toxicity. The product would be labeled for use near water (such as Accord® or Rodeo®) and have the following application rates:

- No more than 7.56 pounds of active ingredient per acre with no added surfactants
- No more than 1.25 pounds of active ingredient per acre with no added surfactants within water source protective strips

Prescribed fire would also be an option for site preparation based on conditions assessed after implementation of the regeneration cut to determine if it would successfully meet site preparation needs. Prescribed fire could also be used as a release treatment for oak.

Enhancing Oak (Planting)

The proposal includes 221 acres of oak planting in stands where oak regeneration treatments would occur. The planting would include oak species (northern red and/or white oak) possibly mixed with eastern white pine for conifer diversity. Trees would be hand planted at a rate of 400 to 700 trees per acre to ensure adequate stocking. Planting rate would be determined by factors such as existing oak regeneration, level of shade, and level of browse by deer or other animals. Lower stocking rates would be used where oak regeneration is already present and where there is low risk of deer browse. Higher stocking rates would be used where there is no oak regeneration and where there is high risk of deer browse.

[1] Site preparation in group selection and group selection with improvement treatments would be proposed and implemented only in the actual group area harvested within each stand or about 20 percent of the total stand area

Supplemental Tree Planting

The proposal includes tree stocking surveys on 4,043 acres[2] in stands proposed for regeneration harvest treatments (clearcuts/patch clearcuts, shelterwood, single tree selection, group selection, and group selection with improvement methods) following the first and third year of harvest to monitor regeneration success. Supplemental tree planting may be necessary if stocking surveys determine natural regeneration is not adequate in any of the regenerated harvest treatment areas.

Depending on stocking needs, hand planting would include a mix of native species at a rate of 200 to 700 trees per acre. Conifer species would be emphasized in areas appropriate for mixed-wood forest habitat and in other cases desirable hardwood species would be planted. Direct seeding through broadcast or aerial means could also be used.

Other Forest Habitat Treatments

The proposal includes a variety of other treatments providing additional habitat diversity to benefit wildlife across the project area (see Table 2-11; Appendix A3, Tables A3-1, A3-2 and A3-3; and Maps 2a-2d, Alternative B Vegetation and Wildlife Habitat Management Activities). The other forest habitat treatments include:

Increase Permanent Upland Openings

The proposal includes land clearing or mechanical mastication of trees to convert existing forest to permanent upland openings on a total of 246 acres (see Photo 5). This treatment includes:

- Creating seven new permanent upland openings totaling 152 acres
- Expanding five existing openings totaling 94 acres

Photo 5. Creation of a permanent opening by mastication
Photo Credit: Scott Wixsom

The initial timber harvest would be followed by further clearing to complete the conversion process of forested stands to permanent upland openings. This clearing would occur within one year following harvest and includes:

- Cutting one to six-inch diameter breast height tree saplings not needed for wildlife
- Leaving stumps in the ground
- Piling and/or burning slash

Maintain Permanent Upland Openings

The proposal includes maintaining existing and newly created permanent upland openings with treatments occurring periodically over a 10-year period at a frequency needed to retain early successional habitat on 615 acres. Treatment areas include 369 acres of existing openings, and 246 acres of new and expanded openings (see Appendix A3, Tables A3-1 and A3-2).

[2] Does not include the 221 acres of oak planting

Permanent upland opening maintenance treatments could include any combination of the following:

- Mechanical mowing or masticating
- Cutting with chainsaws, brush saws, or hand tools
- Prescribed fire (see Photo 6)

Where heavy infestations of non-native invasive plants are present, selection of treatments would be coordinated with a Forest Service botanist. In some cases, control of non-native invasive plants may be integrated with vegetation treatments.

Photo 6. Maintaining a permanent opening with prescribed fire
Photo Credit: Scott Wixsom

Photo 7. Release and pruning treatment of apple trees
Photo Credit: Scott Wixsom

Maintain Apple Trees

The proposal includes the release and pruning of apple trees at nine known sites across the project area covering about 18 total acres within the project area.

Apple tree maintenance treatments would include removing over-topping trees, small saplings and pole-size trees near or under the canopy of individual apple trees using chainsaws, brush saws, or hand tools. Approximately one to two acres would be treated at each site (see Photo 7).

Photo 8. Monarch butterfly using pollinator habitat
Photo Credit: Chris Alexopoulos

Increase Pollinator Habitat

The proposal includes creating pollinator habitat on up to 10 sites within permanent upland openings or closed log landings to benefit pollinator species (see Photo 8). Designated sites would be selected based on available planting area size between one to two acres with favorable aspect and planting conditions, and in areas of low risk for non-native invasive plant invasion. Pollinator habitat establishment would consist of hand planting or mechanically seeding with native-pollinator plant species.

Increase American Marten Habitat

The proposal includes the mechanical piling of up to 10 to 30 percent of harvest slash with piles distributed within designated regeneration harvest treatment areas (clearcut and shelterwood) to create American marten foraging and denning habitat. Stands selected for treatment would be based on post-harvest evaluation of ground conditions.

Fire Line Construction

The proposal includes the construction of fire lines where prescribed fire is proposed (221 acres for oak regeneration and 619 acres for permanent opening maintenance). Prior to the initial burn, a fire line would be in place to maintain a continuous fire barrier either completely around the perimeter of the burn area or

between anchor points (such as roads, trails, or natural barriers). The barrier would be void of flammable material. The level of fire line construction needed would be commensurate with the fuel conditions along the burn unit perimeter.

Where there are large amounts of combustible fuel resulting from mastication or other treatment activities, a fire line would initially and prior to subsequent re-entries be constructed to prevent fire spotting and to safely implement a controlled prescribed fire. Fire line construction may be completed in the following manner using small to mid-sized tracked excavator:

- Clear mulch, chipped material, masticated biomass, and down woody debris from an area 4 to 5 feet wide
- Remove (or cut to ground level) small stumps that would impede safe all-terrain vehicle passage during burn activities
- Scrape a line 18 to 24 inches wide to organic soil depth within the 4 to 5-foot wide cleared zone
- Scatter scraped material within the area to be burned to a depth not to exceed one foot

Where fuel conditions do not warrant fire line construction with tracked equipment, other means such as hand tools, all-terrain vehicle with an attached plow, mower, or other similar equipment would be used to establish a fire line capable of containing the fire.

2.2.2 Fisheries and Water

The proposal consists of treatments designed to improve aquatic habitat including the placement of large wood in streams and providing aquatic passage through culverts (see Map 3, Recreation, Transportation, Soil & Watershed Activities).

Placement of Large Wood

The proposal includes large wood placement on up to approximately 24.2 miles of stream within the project area using hand tools and heavy equipment (see Table 2-2; and Photo 9). Large wood additions would increase instream amounts to between 75 and 130 pieces per mile greater than 12 inches diameter, and 100 pieces per mile between 8 to 12 inches in diameter.

Table 2-2. Streams proposed for large wood placement

Stream Name (includes tributaries)	Large Wood Placement Hand Tools (miles)	Large Wood Placement Heavy Equipment (miles)
Deerfield River	0.8	4.7
East Branch Deerfield River	1.0	0.0
Glastenbury River	1.5	3.3
Black Brook	1.2	0.0
Deer Lick Brook	1.0	1.3
Deer Cabin Brook	0.0	0.4
Blind Brook	2.0	0.0
Rake Branch	0.0	3.7
Redfield Brook	0.0	0.8
Vose Brook	1.4	0.0
Heather Brook	1.1	0.0
Total in Project Area	***10.0***	***14.2***

Large wood placement would be accomplished by one or more of the following:

- Using chainsaws and grip hoists to directionally fell and position onsite trees
- Using grip hoists to pull over trees with attached root wad
- Using log carriers to assist in placing trees in desired stream locations
- Using heavy equipment including ground-based excavator and/or helicopter to place wood in stream sections where channel width is greater than 25 feet

Photo 9. Large wood placement in stream
Photo Credit: Scott Wixsom

Large Wood Sources for Heavy Equipment Placement

The proposal includes the use of heavy equipment (excavator or helicopter) to place large wood in the wider channel sections using mature red pine trees from the proposed harvest areas in Compartments 104, Stand 11a and the existing permanent openings in Compartment 102, Stands 10 and 107. Heavy equipment would be used for whole tree harvest and stockpiling on site until they are ready for placement. Approximately one third of these trees would be harvested with the root wads attached. Stockpiled trees would be trucked and placed with an excavator or transported and placed by helicopter.

Provide Aquatic Organism Passage

The proposal includes the replacement of the existing pipe culvert on Castle Meadow Trail (Corridor 7) with a structure, such as a bottom-less arch culvert or bridge, to allow aquatic organism passage and flood resiliency. This activity would require the use of heavy equipment such as an excavator. Site conditions and topographic surveys would determine the most appropriate structure.

A bottom-less arch culvert consists of a steel arch attached to poured concrete footings on either side of the stream channel. The stream bed would be constructed through the arch to mimic the stream elevations both above and below the structure and the trail would pass over the steel arch structure (see Photo 10).

Photo 10. Bottom-less arch culvert
Photo credit: Dan McKinley

A bridge would be constructed using a standard engineered bridge design to allow for unimpeded flow of the stream.

2.2.3 Soil and Wetlands

The proposal includes management activities to improve soil and wetland conditions within the project area (see Map 3, Recreation, Transportation, Soil & Watershed Activities; and Table 2-3). Except where hand-crews are needed due to access constraints, erosion stabilization is proposed on 10 existing non-system road segments totaling up to 10.8 miles throughout the project area using tracked equipment. Improvement activities would occur during the summer. Soil and wetland improvement activities include:

- Placing berms and/or boulders to block road access (see Table 2-3; and Photo 11)
- Installing water bars and/or check dams along the roads where needed
- Re-contouring road sections to improve drainage
- Seeding and mulching when necessary following all soil-disturbing activity associated with heavy equipment use

Photo 11. Placement of boulder barrier on a closed road
Photo Credit: Scott Wixsom

Table 2-3. Proposed activities to block access to non-system roads

Location[1]	Description of Activity
S01	Install boulders to block access to non-system road
S02	Install boulders to block OHV access to non-system road
S03	Install boulders to block OHV access to non-system road
S04	Install boulders or berm, set back to block many non-system trails
S05	Install boulders or berm to block access to non-system snowmobile trail
S06	Install boulders to block access to non-system trail
S07	Install boulders to block access to non-system road
S08	Install boulders to block access to non-system road
S09	Install boulders and repair berm to block access to non-system road
S10	Install boulders or berm to block access to non-system snowmobile trail

[1] As shown on Map 3, Alternative B Recreation, Transportation, Soil & Watershed Activities

2.2.4 Recreation

The proposal includes management activities to provide sustainable recreation opportunities within the project area including trail use and developed recreation (see Tables 2-4, 2-5, and 2-6; Grout Pond Campground Conceptual Plan[3]; and Map 3, Alternative B Recreation, Transportation, Soil & Watershed Activities).

New Trails

Table 2-4 shows new trails to be designated or constructed within the project area. The proposal adds approximately 4.1 miles of non-snow trail and 1.3 miles of snow trail to the National Forest Trail and

[3] Available at http://www.fs.usda.gov/project/?project=53706

Transportation System. All trails will be constructed to Forest Service design standards (National Design Parameters[4]).

Table 2-4. New trails proposed to increase recreation opportunities

Managed Use	Length (miles)	Description of Activity
Mountain Bike, Hike, Cross-Country Ski	2.0	Constructing approximately 2.0 miles of new trail providing connectivity between the Town of Dover, Mount Snow trails, and the National Forest Trail System. The trail would be designed as Class 3 (3 to 4 feet wide) mountain bike trail but also managed for hiking and cross-country skiing. Trail segments include: • 1.6 miles from Handle Road in Dover to the southern Mount Snow ski slopes • 0.4 miles of a horseshoe segment off of segment 1 to provide a beginner-level loop experience Trail construction activities necessary to meet trail standards include: • Using an excavator and/or hand crews to construct drainage structures and to define trail tread • De-brushing, felling trees, and installing signs at trailheads and trail intersections to indicate managed uses and provide user information for the trail network • Installing trail blazes and signs at appropriate locations • Installing stream crossing infrastructure such as bridges, hardened fords or culverts
Hike, Cross-Country Ski	2.1	Constructing approximately 2.1 miles of Class 2 (6 to 18 inches wide) hiking trail connecting the proposed mountain bike trails off Handle Road in the Town of Dover to the Deerfield Ridge Trail. This trail addition would provide a connection from the Town of Dover to the National Forest Trail System. In addition to hiking, the trail would also serve as a skin track for access to the proposed backcountry ski area off Deerfield Ridge. Trail construction activities necessary to meet trail standards are the same as above for the proposed trail between the Town of Dover, Mount Snow trails, and the National Forest Trail System.
Cross-Country Ski	0.4	Constructing approximately 0.4 miles of cross-country ski trail on an existing old skid trail. The trail would serve as a collector route for a proposed backcountry ski area off Deerfield Ridge. The trail would be designed as a Class 3 snowmobile trail for emergency response purposes (8 feet wide) but would be managed for cross-country skiing. The trail would connect with proposed mountain bike and hiking trails off Handle Road in the Town of Dover. Trail construction activities would include: • Using an excavator and/or hand crews to construct and repair drainage structures, de-brush, and install signs at trail intersections and along the base of the backcountry ski area • Installing signs for managed uses, wayfinding and safety information for the backcountry ski area • Installing trail blazes and signs along the trail • Replacing existing snowmobile bridge allowing for emergency access to the backcountry ski area

[4] Available at http://www.fs.fed.us/recreation/programs/trail-management/trail-fundamentals/

Managed Use	Length (miles)	Description of Activity
Cross-Country Ski	0.7	Adding 0.7 miles of existing Catamount Trail to the National Forest Trail System. The trail segment is located on the northeast side of Somerset Reservoir and is a Class 3 cross-country ski trail.
Snowmobile	0.2	Adding 0.7 miles of existing Valley Trail (Valley C100) snowmobile trail to the National Forest Trail System. The trail segment is located in the Town of Wilmington at the end of Forbush Road. It is a Class 3 snowmobile trail on the Vermont Association of Snow Travelers (VAST) trail system.

Trail Improvements

Proposed trail improvements include adding approximately 200 feet of no-deck puncheon or boardwalk, if necessary, to cross a high elevation stunted stature red spruce swamp on the Deerfield Ridge Trail. The puncheon or boardwalk would be constructed within the existing trail prism.

Additionally, proposed trail work includes improving 8.5 miles of the Glastenbury Trail (Forest Trail 375). Improvement work includes opening the trail width to Class 3 snowmobile trail standards (12 feet) to help with areas that are narrow chutes. It would also include adding minor multiple relocations within 200 feet of the existing trail tread to better traverse the terrain and make for a sustainable, more erosion-resistant tread. The work would be primarily completed with an excavator.

Decommission Trails

Table 2-5 shows trails proposed to be decommissioned within the project area. Decommissioning of these trails would be accomplished with an excavator and/or hand crews resulting in the administrative removal of approximately 5.5 miles of trail from the National Forest trail system, including:

- 4.1 miles managed for snowmobiling
- 1.4 miles managed for hiking

Table 2-5. Existing trails proposed to be decommissioned

Trail Name	Length (miles)	Managed Use	Rationale to Decommission	Description of Activity
Section of Deerfield Ridge Trail (FT 326) from Forbush Road to intersection with Binney Brook Trail (FT 326a)	1.4	Hike	Trail segment is not currently maintained and is redundant access to the Deerfield Ridge. The Binney Brook Trail also provides access to the Deerfield Ridge Trail, is maintained, and sees greater use.	Installing boulders at the access point off Forbush Road. Removing signage, trail markers, and any constructed trail features including an old snowmobile bridge. Installing water bars and erosion control where needed. Allowing trail to naturally revegetate. Renaming the Binney Brook Trail so it is the continuation of the Deerfield Ridge Trail.
Deerfield River Trail (FT 379)	3.1	Snowmobile	Trail is not currently maintained and dead-ends where a large bridge washed out during tropical storm Irene in 2011. Trail goes through a wetland to the north which only intermittently freezes.	Removing remaining bridge abutments from previously washed out bridge. Placing boulders on entry points to both trails off FR 71. Removing two existing bridges, signs, and trail markers. Boulder turnoff from FR 83 to side of washed out bridge. Closing dispersed camp site.
Sports Cabin Trail	0.3	Snowmobile	Trail not currently maintained. The cabin	Allowing trail to continue naturally revegetating. Removing culvert, trail

Trail Name	Length (miles)	Managed Use	Rationale to Decommission	Description of Activity
(FT 380)			was deconstructed in 2015 negating access need.	signs, and markers. Boulder entry point off FR 71.
East Deerfield Loop Trail (FT 377)	0.7	Snowmobile	Trail is in poor condition and goes through a wetland where ground intermittently freezes and resource damage occurs.	Decommissioning 0.7 miles of trail. Includes the decommissioning 1.1 miles of trail on Great River Hydro land as a connected action, and removing snowmobiling as a managed use on 1.7 miles of the trail overlapping with Grout Pond Road and the West Loop cross-country ski trail (1.5 miles on Forest Service / 0.2 miles on Great River Hydro). Decommissioning trail sections by placing boulders at Corridor 7 and Grout Pond Road intersections. Restoring trail tread by adding water bars, removing trail signage, and installing managed use signs. Adding section of trail on Grout Pond Road to the West Loop Trail.

Closure of User Created Trails

Numerous user-created non-system trails and trails which pre-date Forest Service land ownership exist on the Handle Road property in the Town of Dover. Trails are in poor condition and/or redundant of proposed trails in the area. User trail closure and area rehabilitation would involve blocking entry points with downed wood, installing water bars where necessary, and removing any trail signage, bridges, culverts, or structures.

Proposed Developed Recreation Activities

Table 2-6 shows proposed activities to improve existing and provide new developed recreation sites within the project area.

Table 2-6. Proposed developed recreation activities

Facility	Description of Activity
Grout Pond Campground	Implementing improvements across the campground and day use areas. Improvements would be implemented in phases and would be funded by various means such as Recreation Enhancement Act fees and capital improvement project funds. Improvement goals include: 1) Improve water quality and sanitation 2) Improve accessibility and recreation experience 3) Increase site capacity **1) Improve Water Quality and Sanitation** • Treating shoreline/campsite interfaces with drainage, hardening, and revegetation to reduce erosion, protect aquatic plants, and provide clear non-motorized boat access points • Moving constructed campsite features 50 feet off shoreline to reduce erosion • Decommissioning campsites #7 and #9 to reduce shoreline erosion • Adding human waste management capacity to the campground o Constructing three new composting toilets and one new single-vault toilet

Facility	Description of Activity
	○ Replacing existing single-vault toilet near parking area with a double-vault toilet • Adding trash collection at parking area **2) Improve Accessibility and Recreation Experience** • Constructing vehicle pull out and installing fee station at campground entrance • Relocating non-motorized boat launch to an area south of existing launch and reclaiming existing launch by grading, drainage, and revegetation • Rerouting, grading, and surfacing (approximately 6,488 square feet) access route from parking area to non-motorized boat launch to meet accessibility guidelines • Replacing existing hand water pump with accessible pump • Re-grading, surfacing, and improving (adding and replacing drainage structures) site drainage on Camp Loop Trail and Pond Loop Trail section from parking area to southern intersection with Camp Loop Trail to meet accessibility guidelines ○ Re-routing, grading, and surfacing campsite access routes (approximately 20,236 square feet) where necessary to improve drainage and meet accessibility guidelines • Hardening all campsites with gravel surfacing ○ Hardening new and existing walk-in campsites (approximately 6,875 square feet) ○ Hardening drive-in/RV campsite pads (approximately 8,949 square feet) • Treating site edges with pressure treated wood and/or rock Constructing boat stands at campsites 1, 2, 10, and 11 and a boat rack at shoreline day use area for non-lakeside campsite boat storage • Reconfiguring existing group campsite area ○ Creating a loop gravel-surfaced road by extending the dead-end road ○ Adding gravel parking spurs, picnic tables, and fire rings • Surfacing group site and access road (approximately 12,738 square feet) **3) Increase Site Capacity** *(net gain of six campsites, one hut, and one cabin)* • Redesigning parking area to a one-way loop ○ Adding 16 parking spaces ○ Surfacing reconfigured parking area and loop road (approximately 20,233 square feet) • Constructing eight additional campsites ○ One host site with solar power, potable water connection, and waste water disposal ○ Five pull-in/ pull-through sites ○ Two walk-in campsites off Camp Loop Trail • Constructing a four-season hut off the Camp Loop Trail ○ Design, construct, operate, and maintain hut with a partner organization via a special use authorization • Demolishing and reconstructing existing cabin for four season use after historical documentation and determination is complete. ○ Reconstructed cabin would serve as optional campground host shelter or camper accommodation through the reservation system For further details, see Grout Pond Campground Conceptual Plan located at: http://www.fs.usda.gov/project/?project=53706
Backcountry Recreation Area	Developing additional backcountry recreation terrain (vicinity of Mount Snow off of Deerfield Ridge Trail) and designating the area a developed recreation snowpark site. Proposed trailhead and trails on the Handle Road property in the Town of Dover would serve as access to skin tracks (up-trails) and collector routes. Located within Diverse Forest Use and Alpine Ski Area Expansion Management Areas, the backcountry area would consist of three “zones” totaling approximately 180 acres. The treatment areas within these zones, known as skiable lines (locations where skier traffic will be encouraged), would be identified and vegetation may be removed from within these lines to

Facility	Description of Activity
	increase space for skier traffic. Specifically, management activities would include: • Removing, thinning, and trimming vegetation to create and enhance skiable lines within the identified zones to a width of 15 to 30 feet but would not include the removal of all trees • Retaining trees within these lines to maintain a closed canopy supporting continued natural ecosystem processes and desirable backcountry ski experience characteristics • Installing signage at Handle Road trailhead and snowpark access points indicating necessary skill level, safety information, backcountry ethics, and wayfinding

Connected Actions

A parking area and trailhead would be constructed off of Handle Road in the Town of Dover. The gravel parking area would be approximately 150 feet wide by 25 feet deep/long and accommodate approximately 13 vehicles. The parking area would be within the road right-of-way and private properties but allow access to National Forest System land. Design and construction would be completed by the Town of Dover.

The trailhead would serve proposed trails and backcountry recreation area (snowpark) off the Deerfield Ridge. Trailhead construction would include a kiosk to provide wayfinding and other information.

2.2.5 Visual Quality

The proposal includes scenery management treatments at seven sites to maintain and enhance viewing opportunities within the project area (see Table 2-7; and Map 3, Alternative B Recreation, Transportation, Soil & Watershed Activities). Management at these sites typically includes actively cutting trees, tree limbs or other vegetation by a variety of means identified below.

Table 2-7. Proposed scenery management treatment

Location	Description of Treatment
Along the Appalachian Trail/Long Trail	**Goddard Shelter:** Removing vegetation using hand saws to restore existing vista inventory azimuths. **Vista east of the Top of the Mountain Trail:** Expanding and enhancing existing vista up to two acres to the northeast using mechanical mastication and chain saws. Maintaining existing vistas along the Appalachian Trail/Long Trail outside of wilderness as needed using hand saws.
Along Deerfield Ridge	**Haystack Mountain Summit:** Maintaining existing vista at summit of Haystack Mountain and enhancing vista to the south with hand tools. **Deerfield Ridge Trail:** Creating two new vistas on the Deerfield Ridge Trail, one looking east in the area between the intersection of Binney Brook Trail and Haystack Mountain Trail and the second looking west between the Haystack Mountain Trail and Mount Snow using chain saws and hand tools.
Along Forest Road 71	**Shep's Meadow:** Maintaining existing inventoried vista azimuths using hand tools or chainsaws. **Wetlands south of FR 86:** Maintaining existing inventoried vista using chain saws and hand tools.

2.2.6 Transportation (Roads and Infrastructure)

Proposed road reconstruction together with the existing roads under Forest Service, town, and state jurisdiction would provide a sustainable transportation network to meet public and administrative access needs within the project area. See Maps 2a-2d, Alternative B Vegetation and Wildlife Habitat Management Activities; and Map 3, Alternative B Recreation, Transportation, Soil & Watershed Activities for locations of proposed system road reconstruction, temporary road construction, road decommissioning, and other associated road infrastructure. All proposed road activities would be implemented using customary mechanized power equipment and machinery.

System Roads

Timber access within the project area would not require construction of new Operation Maintenance Level (OML) 1 roads; however, up to 17.7 miles of existing OML 1 roads would be used as needed for timber access. These roads would be reconstructed or maintained to a level sufficient for hauling. Any road reconstruction activities would include:

- Retaining road surface width to a maximum of 14 feet with ditches or fill slope four feet wider on either side for a total clearing width of 22 feet (see Photo 12)
- Using native and imported material
- Placing drainage structures as needed

Photo 12. OML 1 road
Photo Credit: David Donahue

During the time Operation Maintenance Level 1 roads are closed to vehicular traffic, they are intermittent service roads used administratively for access to complete activities such as prescribed fire burns or resource survey work. The following actions would occur after their use for proposed timber harvest activities:

- Removing drainage structures
- Placing barriers to prohibit motorized vehicle access
- Performing basic custodial maintenance to minimize impacts to adjacent resources and to perpetuate the road for future management activities

Forest Service Road (FR) 275, currently OML 2 for the entire length (1.6 miles), is proposed to have its mileage of OML 2 reduced in length to 0.7 mile with the remaining 0.9 mile reclassified as OML 1. A barrier would be placed at the beginning of the OML 1 segment and would be managed for this maintenance level.

Temporary Roads

Temporary roads are minimum-standard roads designed for short-term use during a specific project (see Photo 13). The heart of the Somerset project area is within the unincorporated Town of Somerset. The lack of town roads renders a large component of timber stands proposed for treatment inaccessible by the existing transportation network. This is not typical for most parts of the Green Mountain National Forest thus more temporary road construction is anticipated for this project compared to other projects

Photo 13. Temporary road
Photo Credit: Bill Garrison

of similar scope. There may be up to 15 individual timber sales implemented over a five to ten-year period to harvest proposed stands. This would require an average of just over 2.0 miles of temporary roads per sale for a total of 31.7 miles over the life of the project.

Table 2-8 provides proposed temporary road construction needed to access timber stands within the Somerset project. The majority of temporary roads would follow the template of existing non-system woods roads or trails (see Photo 14). Only 2.3 miles of temporary road construction would be in locations where no non-system woods roads or trails exist.

Photo 14. Existing non-system woods road
Photo Credit: Laura McRee

Table 2-8. Proposed temporary road construction

Description	Length (miles)
Follows existing non-system woods road/trail	21.9
Follows existing system trail[1]	7.5
New temporary road location[2]	2.3
Total	**31.7**

[1] Temporary roads constructed over existing system trails, such as snowmobile trails
[2] New temporary road construction needed where there is no existing road or trail template

The construction of temporary roads would be the same width as an OML 1 road (14 feet with four additional feet on either side for ditches or fill slope) but strive for the minimum width needed to allow for the passage of equipment. The following actions would occur after their use for proposed timber harvest activities (see Photo 15):

- Removing bridges, culverts, and crossing structures
- Returning road template to pre-use conditions after use as needed to stabilize soil and maintain natural stream hydrology
- Placing organic material, berms, or barriers to prohibit motorized vehicle access

Photo 15. Closed temporary road
Photo Credit: David Donahue

Road Decommissioning

Road decommissioning is a means to accomplish a minimum road system which provides safe and efficient travel for administration, utilization, and protection of National Forest System lands. The proposal includes the decommissioning of six existing system roads totaling approximately 3.83 miles (see Table 2-9).

Road decommissioning closes the road and stabilizes resource conditions. This includes the removing all structures, ensuring adequate drainage, promoting vegetation growth and, where needed, and stabilizing embankments and slopes. In most cases, the road template would not be removed in its entirety due to the cost prohibitive nature of this work.

Table 2-9. Roads proposed for decommissioning

Road Number	Length (miles)
72A	0.30
72C	0.26
86[1]	0.57
325A	0.10
325B	0.60
372[2]	0.80
373A[2]	0.50
375	0.70
Total	**3.83**

[1] The remaining 0.39 miles of Forest Road 86 would be retained as an OML 2 system road

[2] Forest Roads 372 and 373A would be decommissioned and no longer maintained as a system road; no closure work would occur since they are also designated trails and would remain on the trail system.

Bridge Replacement

The proposal includes the replacement of the existing bridge on Forest System Road 83 at mile post 0.01. The existing bridge has timber beams and decking on timber abutments and is nearing the end of its service life. Construction would be expected to be completed within four months of the start date and includes the following activities:

- Constructing a single lane structure designed to pass the 100-year frequency storm event and American Association of State Highway and Transportation Officials (AASHTO) design guidelines for the structural components of the bridge
- Closing the road during construction

Gate Placement/Relocation

The proposal includes one new gate at milepost 0.07 on Forest Road 275 to restrict seasonal access. The gate would be placed on concrete foundations requiring 4 by 4 by 5-foot deep holes. Adequate space for a turnaround would be provided at the location.

2.2.7 Heritage

The proposal includes the restoration of the Somerset Schoolhouse in consultation with the Vermont State Historic Preservation Office. The schoolhouse is listed on the National Register of Historic Places and is located on along Forest Road 385 just north of the Somerset Airfield (see Map 3, Recreation, Transportation, Soil & Watershed Activities).

Restoration activities include:

- Exterior painting
- Sealing the roof
- General maintenance such as pruning vegetation, repairing window shutters, and replacing locks

2.3 Alternative C: Reduced Roads

Alternative C was developed and included for detailed analysis to address public concerns associated with potential resource effects from the amount and location of temporary roads proposed for timber harvest activities. Table 2-11 at the end of Chapter 2 provides a summary of Alternative C management activities.

A series of maps specific to Alternative C provide the location of proposed activities and include:

- **Maps 2a, 2b, 2c, and 2d, Alternative C Vegetation and Wildlife Habitat Management Activities** display the proposed vegetation and wildlife treatment activities
- **Map 3, Alternative C Recreation, Transportation, Soil & Watershed Activities** displays the proposed recreation, transportation (including road and trail projects), aquatic, soil and heritage activities

Alternative C is different from Alternative B for the following resource activities (all others are the same as those described in Alternative B - see preceding Section 2.2):

Forest Habitat and Timber Resources

Timber Harvest Treatments

Alternative C includes timber harvest treatments on a total of 8,861 acres including uneven-aged and even-aged harvests using a variety of silvicultural methods and land clearing to create permanent upland openings (see Table 2-11; Appendix A2, Table A2-1, and Appendix A3, Table A3-1; and Maps 2a-2d, Alternative C Vegetation and Wildlife Habitat Management Activities).

Proposed timber harvest treatment methods include (see Table 2-1):

- 5,236 acres of uneven-aged harvest treatments including single tree selection on 319 acres and group selection on 4,917 acres (both group selection and group selection with improvement)
- 3,379 acres of even-aged harvest treatments including regeneration cuts on 2,716 acres (shelterwood and clearcuts) and intermediate cuts on 663 acres (thinning and improvement cuts)

Transportation Network

Alternative C includes construction of an estimated 97 new log landings as well as skid roads/trails in locations needed to access all areas being considered for harvest.

Post-Harvest Activities

Site Preparation for Natural or Artificial Regeneration

Alternative C includes 4,019 acres of site preparation to provide for natural or artificial regeneration of stands proposed for harvest using clearcuts, shelterwood, single tree selection, group selection, and group selection with improvement methods.

Supplemental Tree Planting

Alternative C includes tree stocking surveys on 3,798 acres in stands proposed for regeneration harvest treatments (clearcuts/patch clearcuts, shelterwood, single tree selection, group selection, and group selection with improvement methods) following the first and third year of harvest to monitor regeneration success.

Soil and Wetlands

Alternative C includes management activities to improve soil and wetland conditions within the project area on 11 existing non-system road segments totaling up to 10.9 miles. The additional 0.1-mile road segment compared to Alternative B is located just south of Castle Meadow Trail (see Map 3, Alternative C Recreation, Transportation, Soil & Watershed Activities). Work would include the obliteration of the road template near the wetland and restore road contour where in-sloped ditches intercept subsurface flow.

Transportation (Roads and Infrastructure)

Temporary Roads

Table 2-10 provides proposed temporary road construction needed to access timber stands within the Somerset project for Alternative C. See Maps 2a-2d, Alternative C Vegetation and Wildlife Habitat Management Activities; and Map 3, Alternative C Recreation, Transportation, Soil & Watershed Activities for locations of proposed temporary road construction. Only 0.8 miles of temporary road construction would be in locations where no non-system woods roads or trails exist.

Table 2-10. Proposed temporary road construction for Alternative C

Description	Length (miles)
Follows existing non-system woods road/trail	11.6
Follows existing system trail[1]	5.0
New temporary road location[2]	0.8
Total	**17.4**

[1] Temporary roads constructed over existing system trails, such as snowmobile trails
[2] New temporary road construction needed where there is no existing road or trail template

2.4 Action Alternatives Summary

Table 2-11 provides the summary of all management activities included in Alternatives B and C.

Table 2-11. Summary of Action Alternatives B and C

Resource	Alternative B	Alternative C
Forest Habitat and Timber Resources		
Timber Harvest Treatments		
Uneven-aged harvest method[1]		
Group selection with improvement cuts	3,325 acres	3,131 acres
Group selection	2,200 acres	1,786 acres
Single tree selection	344 acres	319 acres
Total uneven-aged harvest	***5,689 acres***	***5,236 acres***
Even-aged harvest method[1]		
Regeneration - shelterwood	2,829 acres	2,695 acres
Regeneration - clearcut	21 acres	21 acres
Total regeneration harvest treatments	***2,850 acres***	***2,716 acres***
Intermediate – Thinning and improvement cuts	759 acres	663 acres
Total intermediate harvest treatments	***759 acres***	***663 acres***
Total even-aged harvest (regeneration and intermediate)	***3,609 acres***	***3,379 acres***
Total Number of Acres Treated	**9,298 acres**	**8,615 acres**
Post-Harvest Treatments		
Site preparation for natural or artificial regeneration (hand)	4,264 acres	4,019 acres
Site preparation for oak planting (cut stump herbicide and prescribed fire)	221 acres	221 acres
General tree planting to supplement natural regeneration where needed	4,043 acres	3,798 acres
Tree planting (oak/pine)	221 acres	221 acres
Other Forest Habitat Treatments		
Timber stand improvement[1]	413 acres	413 acres
Create new permanent upland openings[1,2]	7 stands; 152 acres	7 stands; 152 acres
Expand existing permanent upland openings[1,2]	5 stands, 94 acres	5 stands, 94 acres
Maintenance of permanent upland openings (existing and newly created)[2]	619 acres	619 acres
Release and prune apple trees[2]	9 sites, 18 acres	9 sites, 18 acres
Increase pollinator habitat	selected sites	selected sites
[1] Appendix A2 lists the proposed harvest treatments, number of harvest acres for each Compartment/Stand, and the actual treatment acres proposed for each harvest method; includes timber stand improvement stands		
[2] Appendix A3 lists proposed treatments designed to primarily benefit wildlife habitat		
Fisheries and Water		
Large wood placement (hand tools)	10.0 miles	10.0 miles
Large wood placement (heavy equipment)	14.2 miles	14.2 miles
Total large wood placement	***24.2 miles***	***24.2 miles***
Replace culvert with aquatic organism passage structure	1 site	1 site
Soil and Wetlands		
Stabilize existing non-system woods roads	10.8 miles	10.9 miles
Block non-system woods roads to vehicle access	10 roads	11 roads
Recreation		
Trails		
Designate or construct new terra trails	4.1 miles	4.1 miles
Designate or construct new snow trails	1.3 miles	1.3 miles
Total new trail construction	***5.4 miles***	***5.4 miles***

Resource	Alternative B	Alternative C
Construct trail boardwalk along Deerfield Ridge Trail	about 200 feet	about 200 feet
Improve existing snowmobile trail	8.5 miles	8.5 miles
Decommission snowmobile trails	4.1 miles	4.1 miles
Decommission hiking trails	1.4 miles	1.4 miles
Total trail decommissioning	***5.5 miles***	***5.5 miles***
Close user crated non-system trails on Handle Road property	yes	yes
Developed Recreation		
Improve Grout Pond campground	yes	yes
Develop and designate snowpark with backcountry ski zones	3 zones, 180 acres	3 zones, 180 acres
Construct parking area and trailhead off of Handle Road (private land)	13 vehicle spaces	13 vehicle spaces
Visual Quality		
Maintain and enhance viewing opportunities	7 sites	7 sites
Transportation (Roads and Infrastructure)		
System Roads		
Construct new log landings	134	97
Reconstruct or maintain existing OML 1 roads for timber access	17.7 miles	17.7 miles
Change part of Forest Road 275 from OML 2 to OML 1	0.9 miles	0.9 miles
Decommission roads	6 roads, 2.53 miles	6 roads, 2.53 miles
Remove roads from system but retain as designated trails	2 roads, 1.3 miles	2 roads, 1.3 miles
Temporary Roads		
Construct on non-system roads or trails	21.9 miles	11.6 miles
Construct on existing system trails	7.5 miles	5.0 miles
Construct in new location	2.3 miles	0.8 miles
Total temporary road construction	***31.7 miles***	***17.4 miles***
Close and restore temporary roads after use	31.7 miles	17.4 miles
Infrastructure		
Bridge replacement on Forest Road 83	yes	yes
Gate placement on Forest Road 275	yes	yes
Heritage		
Restore the Somerset Schoolhouse (exterior painting, sealing roof and general maintenance)	yes	yes

2.5 Effects Summary

Table 2-12 provides a summary of the environmental effects from Alternatives B and C associated with the relevant issues of resource concern identified from public comments. The effects for each resource are disclosed in more detail in Chapter 3.

Table 2-12. Summary of the environmental effects for resources of concern

Indicator	Threshold	Effects
Forest Habitat		
Issue Statement: *Management activities could alter American marten habitat by shifting the forest stand age class distribution.*		
The percent of the project area converted to early successional habitat, which martens tend to avoid.	The New Hampshire American marten guideline for no more than 40 percent of the forested landscape should be in early successional or young forest stages is not met (Kilborn unpublished).	**Alternative B** 3,096 acres of early successional habitat created (0.078 or 7.8 percent of the total project area). Adverse impacts to martens and their habitat are unlikely. **Alternative C** 2,962 acres of early successional habitat created (0.074 or 7.4 percent of the total project area). The difference in effects associated with American marten habitat compared to Alternative B is negligible.
Forest Health		
Issue Statement: *Timber harvest activities, including temporary road construction and use could introduce and spread non-native invasive plant species.*		
The potential to increase non-native invasive plant occurrence within the project area is the extent of known infestations adjacent to or overlapping proposed harvest and road construction activities, in combination with the species-specific problems they can cause. These factors are combined to develop a risk rating (USDA Forest Service 2003) to ascertain the risk of introducing, establishing, or spreading invasive species associated with proposed activities, and to provide the needed measures to reduce or eliminate the risk.	Non-native invasive plants increase in stands where vegetation management occurs, to the extent project goals cannot be met, or other forest resources, including rare plant species, would be negatively affected. This threshold could be reached if necessary measures to reduce or eliminate risk were either not followed or not effective.	**Alternative B** If mitigation measures and risk rating determinations are followed (Appendix B, Non-native Invasive Plants), potential of reaching non-native invasive plants adverse effects thresholds will be reduced. **Alternative C** Reduced roads and harvest treatment acres result in fewer pathways of dispersal for non-native invasive plants, and less ground disturbance that could facilitate their establishment.

Indicator	Threshold	Effects
Threatened, Endangered or Sensitive Wildlife		
Issue Statement: *Management activities could impact threatened or endangered wildlife species.*		
Changes to northern long-eared bat foraging, roosting, and hibernating habitat; cutting of trees during sensitive time periods which would risk direct take of individuals.	Actions or habitat changes which do not meet agency responsibilities required by the Endangered Species Act Section 7(a)(2) and the Final 4(d) Rule relative to the northern long-eared bat.	**Alternative B** Some treatments will temporarily reduce the number of roosting trees available to northern long-eared bats, but the species are not limited by summer habitat. In the long-term, forest health treatments will benefit the species. The analysis process satisfies the Forest Service's responsibilities under the Endangered Species Act Section 7(a)(2) and the Final 4(d) Rule relative to the northern long-eared bat. **Alternative C** Differences compared to Alternative B are indiscernible.
Issue Statement: *Management activities could impact sensitive wildlife species.*		
Relative changes in the amount, distribution, and overall availability of suitable habitats for affected species.	Management activities result in a loss of population viability or trend toward federal listing for any sensitive wildlife species on the Green Mountain National Forest (Forest Service Manual 2670).	**Alternative B** Sensitive Wildlife Species = No effect likely causing a trend toward federal listing or loss of viability. **Alternative C** Differences compared to Alternative B are indiscernible.
Threatened, Endangered or Sensitive Plants		
Issue Statement: *Management activities could impact sensitive plant species.*		
The nature and extent of effects to plants on the Regional Forester Sensitive Species list.	Management activities result in a loss of population viability or trend toward federal listing for any sensitive plant species on the Green Mountain National Forest (Forest Service Manual 2670).	**Alternative B** Sensitive Plant Species = No federally listed plants on the Green Mountain National Forest and no effect likely causing a trend toward federal listing or loss of viability. **Alternative C** No difference in effects compared to Alternative B.

Indicator	Threshold	Effects
Aquatic Resources		
Issue Statement: *Proposed road construction and use could impact water quality.*		
• Road density (miles of road per square mile of watershed). • Road proximity to streams (percent of roads within 300 feet of streams). • Percent of roads where Best Management Practices for Water Quality (USDA Forest Service 2012b) to maintain and design roads are followed. • Potential for mass wasting.	Watershed Condition Classification for Road and Trail Condition Indicator attributes (Road Density, Proximity to Stream, and Best Management Practices Application) change from good (functioning properly) to fair (functioning at risk); or fair to poor (impaired function). (USDA Forest Service 2011)	**Alternative B** No change to existing Water Condition Classification for Road and Trail Condition Indicator attributes. **Alternative C** Reduced roads and harvest treatment acres decrease the potential for minor short-term effects associated with water quality from sedimentation and overall hydrological watershed functions. The Water Condition Classification attribute ratings would be the same as Alternative B.
Issue Statement: *Management activities could affect the water quality in streams including those classified as A(1) per the Vermont Department of Environmental Conservation Guidelines.*		
State water quality standards for Class A(1) surface waters.	Effects from management activities result in not meeting Vermont Water Quality Standards (VANR 2017).	**Alternative B** Effects meet Vermont Water Quality Standards. **Alternative C** No difference in effects compared to Alternative B.
Issue Statement: *Land clearing and creation of a permanent upland opening at the intersection of Forest Road 71 and Somerset Road (Compartment 102/Stand 10) could destabilize the temperature of the Deerfield River.*		
Application of Forest Plan standards and guidelines that protect stream temperatures.	Maintaining at least a 70 percent canopy closure of streams with objective of an average daily water temperature less than 72 degrees Fahrenheit is not met (Forest Plan, page 22).	**Alternative B** Forest Plan guideline application would maintain at least 70 percent shade along Deerfield River headwaters. River temperatures would be maintained at desired temperatures. **Alternative C** No difference in effects compared to Alternative B.

Indicator	Threshold	Effects
Soil and Wetlands		
Issue Statement: *Timber harvesting activities including landing, skid road, and skid trail construction and use could compact soils, increase erosion, reduce soil productivity and damage wetland functions.*		
The Somerset project soil quality standards (Quintana 2020) provide the indicators and maximum amount of area of harvest treatment units affected (threshold) where soil property changes from harvest activities retain a low risk of negatively affecting ecosystem components, functions, or services		**Alternative B** The intensity and extent of soil disturbance is within acceptable levels. A low risk of negatively affecting ecosystem components, functions, or services is retained. **Alternative C** Although the effects would be similar to Alternative B, there would be approximately eight percent less acres affected by timber harvest activities on soils with sensitive attributes.
Issue Statement: *Temporary road construction and use could compact soils, increase erosion, reduce soil productivity and damage wetland functions.*		
• Miles and acres of proposed temporary road construction provides the amount of disturbance resulting in reduced soil productivity. These areas are not expected to support productive forest regeneration over the next 20-30 years. • Percent of harvest impact area affected by proposed temporary road construction. The harvest impact area is defined as the total acres of stands proposed for harvest plus temporary roads needed for access. • Miles and acres of proposed temporary road construction with sensitive soil attributes such as shallow, very poorly drained or poorly drained soils; or having a severe erosion hazard rating or steep slopes; or crossing near or within a wetland. • Percent of harvest impact area affected by temporary road construction with sensitive soil attributes. A greater percentage of the harvest impact area covered with roads with sensitive soils represents higher risk for more intense detrimental soil disturbance.	Temporary road construction and use results in unacceptable levels of soil and wetland resource degradation.	**Alternative B** 31.7 miles of temporary road construction affecting 84.5 acres. 0.88 percent of harvest impact area affected by temporary roads. 21.7 miles of temporary road construction following existing non-system roads/trails with at least one sensitive soil attribute affecting 57.8 acres or 0.6 percent of the harvest impact area. 1.7 miles of new temporary road construction with at least one sensitive soil attribute affecting 4.5 acres or 0.06 percent of the harvest impact area. Soil and wetland resource effects from temporary road construction and use would be within acceptable levels. **Alternative C** 17.4 miles of temporary road construction affecting 46.4 acres. 0.52 percent of harvest impact area affected by temporary roads. 12.5 miles of temporary road construction following existing non-system roads/trails with at least one sensitive soil attribute affecting 33.4 acres or 0.38 percent of the harvest impact area. 0.6 miles of new temporary road construction with at least one sensitive soil attribute affecting 1.7 acres or

Indicator	Threshold	Effects
		0.02 percent of the harvest impact area. Although soil and wetland resource effects from temporary road construction and use would be within acceptable levels, there would be substantially less effects associated with most indicators of detrimental reductions in long-term soil productivity. This would result in a proportionate reduction in soil compaction, erosion, reduced soil productivity, and damage to wetland functions.
Issue Statement: *Land clearing and creation of a permanent upland opening at the intersection of Forest Road 71 and Somerset Road (Compartment 102/Stand 10) could increase erosion.*		
Amount of soil disturbed from land clearing including removal of root wads.	Land clearing and removal of root wads results in sedimentation of the Deerfield River to levels adversely affecting water quality and other attributes of aquatic habitat.	**Alternative B** Erosion resulting in sedimentation of the Deerfield River would remain within acceptable levels and would not have adverse effects related to water quality and other attributes of aquatic habitat **Alternative C** No difference in effects compared to Alternative B.
Issue Statement: *Prescribed fire including the construction of fire lines could damage soil quality and wetland functions.*		
• Amount of prescribed fire. • Amount of fire line constructed.	Prescribed fire and fire line construction results in unacceptable levels of soil and wetland resource degradation.	**Alternative B** Soil and wetland resource effects from prescribed fire and fire line construction would be within acceptable levels. **Alternative C** No difference in effects compared to Alternative B.
Recreation		
Issue Statement: *Decommissioning snowmobile trails could negatively impact the snowmobile user experience.*		
Deterioration of snowmobile user experience.	Reduction of trails causes a measurable adverse impact to the snowmobile user experience.	**Alternative B** Decommission 4.1 miles out of 70 total miles (six percent) of existing snowmobile trails within the project area. Effects to the snowmobile user experience would likely be minimal. **Alternative C** No difference in effects compared to Alternative B.
Issue Statement: *Timber harvest activities could negatively impact the snowmobile user experience when haul or skidding takes place on or across trails.*		
Closure or disruption of snowmobile	Trail closure or disruption causes	**Alternative B**

Indicator	Threshold	Effects
trail use.	unacceptable decrease in the snowmobile user experience.	Negative effects associated with the snowmobile user experience would be minimal.
		Alternative C
		There would be 2.2 fewer miles of system snowmobile trails proposed for temporary road use to access harvest treatment areas compared to Alternative B. This may have slight but negligible changes in effects to snowmobile trail continuity.
Issue Statement: *Timber harvest activities could negatively impact scenery as observed by cross-country skiers on the Catamount Trail.*		
Visual quality objectives (Forest Plan, Chapter 2, Tables 2.3-2 and 2.3-3).	Does not meet visual quality objectives.	**Alternative B**
		Meets visual quality objectives. Visual (scenery) effects would be minimal.
		Alternative C
		Differences compared to Alternative B are indiscernible.
Issue Statement: *Management activities could degrade the eligibility of identified recreational or scenic rivers for future inclusion in the National Wild and Scenic River System.*		
Classification characteristics and outstandingly remarkable values for potential recreational or scenic river designation (Forest Plan, Chapter 3, Eligible Wild, Scenic, and Recreational Rivers Management Area).	Desired conditions are not met to retain recreational or scenic river eligibility.	**Alternative B**
		Effects associated with classification characteristics and outstandingly remarkable values for Wardsboro Brook and Deerfield River would not reduce the eligibility for their potential addition to the National Wild and Scenic Rivers System.
		Alternative C
		There would be a slight reduction in effects for the outstandingly remarkable value of “Scenic” within the Wardsboro Brook management corridor. All other effects are the same as Alternative B.
Heritage		
Issue Statement: *Management activities could disturb heritage resources within the project area; heritage sites should be protected.*		
The proximity of the various proposed activities to heritage resources.	When an activity destroys, damages, alters, or removes a property or its characteristics or place the heritage value of the resource at risk.	**Alternative B**
		No effect.
		Alternative C
		No effect.

Indicator	Threshold	Effects
Carbon and Greenhouse Gas Emissions		
Issue Statement: *Timber harvest activities could reduce the forest's ability to sequester carbon and mitigate greenhouse gas emissions.*		
• Amount of carbon loss from forested stands. • Amount of carbon emitted into the atmosphere.	Levels of carbon loss results in the forest to shift from a carbon sink to a carbon source. Levels of carbon emitted into the atmosphere has a measurable adverse effect.	**Alternative B**
		Although forest harvest would result in some initial loss of carbon to the atmosphere when just considering ecosystem carbon stocks, losses are expected to be replaced over time as the stands regrow. The forest would remain a carbon sink. The direct and indirect contribution to greenhouse gas emissions and climate change would be negligible.
		Alternative C
		Differences compared to Alternative B are indiscernible.

3. Environmental Impacts

This chapter discloses the direct, indirect, and cumulative environmental effects from the alternatives as described in Chapter 2. It consists of a description of the existing condition ("affected environment") for each resource area and discloses the environmental effects for the resource under each alternative.

Each resource section in Chapter 3 is organized in the following sequence:

Issues

Relevant issues from public comments and Forest Service review provide the primary basis for environmental effects.

Direct and Indirect Effects Analysis Area

The direct and indirect effects analysis area provides the "area of influence" where the effects are predicted to take place.

Affected Environment

The affected environment describes the existing conditions within the area of influence.

Direct and Indirect Effects

Direct and indirect effects are disclosed from the activities included under each alternative.

Cumulative Effects

Cumulative effects are disclosed from other past, present or reasonably foreseeable future actions on National Forest System and non-National Forest System lands that may overlap in time and space with direct and indirect effects.

3.1 Resource Effects Not Included for Detailed Analysis

Resources associated with concerns from comments received during the March 2019 scoping and Somerset project environmental assessment comment periods have negligible or no effects from the action alternatives. Disclosed effects are indiscernible between Alternatives B and C unless otherwise noted. Although these resource effects are not included for detailed analysis in the environmental assessment, they are summarized in Table 3-1.

Table 3-1. Resources with negligible or no effects

Issue Statement	Effects
Wildlife and Ecological Features	
The backcountry recreation area including the proposed mountain bike trail and backcountry ski zones could impact wildlife population viability, habitat connectivity, integrity of habitat features and the ecological value of the montane spruce forest and montane yellow birch-red spruce forest high quality natural areas.	Effects associated with wildlife population viability, habitat connectivity, and integrity of habitat features would be negligible because the ski zones would be less than 30 feet wide and include the retention of a closed canopy of over-story trees. Likewise, the bike trail would have negligible effects since habitat alteration would be immeasurable. Effects to wildlife species as a result of human presence and noise could also impact individuals near the trail. Potential effects could include displacement, increased levels of stress hormones, abandonment of nest sites, or collisions. The specific nature and extent of these effects would vary by species and diminish with increased distance from the trail. These effects are expected to be

Issue Statement	Effects
	negligible based on the small amount of proposed new trail in the area and the concurrent proposed trail decommissioning. The montane spruce forest and montane yellow birch-red spruce forest are small patch communities and rare species habitat. They are recognized by the Vermont Agency of Natural Resources as important conservation habitats. These areas provide the important function of serving as refugia for rare species in the landscape and region (USDA Forest Service 2018a). There are approximately 579 acres of montane spruce-fir forest and 1,050 acres of montane yellow birch-red spruce forest along Deerfield Ridge in the vicinity of the proposed backcountry ski zones. The ski zones would affect about 1.1 percent and 1.2 percent of these areas respectively. The minimal amount affected along with the retained cover associated with the ski zones would result in a negligible effect to these communities.
Timber harvest activities could negatively impact bear habitat including sources of critical mast located near the proposed backcountry recreation area.	The proposed backcountry recreation area consisting of three ski zones totaling 180 acres would not be detrimental to general bear habitat because they would be less than 30-feet wide and retain closed canopy conditions. A stand of mast producing beech is located to the south of Mount Snow and east of the Deerfield Ridge trail (VANR 2020a). Available data does not indicate how large this mast resource is, but if there is any overlap at all between it and the proposed activities, the mast resource buffer just barely reaches the boundary of "closed user-created trails" which is adjacent to the most southerly proposed backcountry zone. The closest timber harvest activity to this location is approximately 2.5 miles to the west. For these reasons, there are no anticipated effects to this resource.
Timber harvest activities could negatively impact deer winter area habitat within the project area.	Deer wintering areas within the Somerset project area were identified using the Vermont Agency of Natural Resources GIS database (VANR 2020b). Deer winter habitat is critical to the long-term survival of white-tailed deer (*Odocoileus virginianus*) in Vermont. Functional winter habitats in Vermont are essential to maintain stable populations because they are near the northern extreme of the white-tailed deer's range. Deer wintering areas are generally characterized by rather dense softwood (conifer) cover, such as hemlock, balsam fir, red spruce, or white pine. Occasionally they are found in mixed forest with a strong softwood component or even on west facing hardwood slopes in conjunction with softwood cover. There are 10 deer wintering areas within the project area totaling 2,951 acres (including private land). Of this total, there are three deer wintering areas on National Forest System lands totaling 695 acres. Approximately 162 acres of proposed harvest treatment would occur within the deer wintering areas in Alternative B (100 acres of even-aged shelterwood treatment and 62 acres of uneven-aged group selection or group selection with improvement treatments). Alternative C proposed even-aged harvest acres within deer wintering areas would be 13 acres less than Alternative B. All even-aged harvest acres occur in hardwood forest types for both alternatives, so no softwood sheltering stands would be affected.
Construction of roads could increase migration barriers for species requiring large blocks of forest such as bear, marten and moose.	Restriction of movement by temporary forest roads is not considered an adverse negative impact relative to other factors such as an increase in vulnerability to hunting. The effect from roads associated with the movement of wildlife requiring large blocks of habitat is dependent on food availability and road density; the less food

Issue Statement	Effects
	available, the more an animal must travel. The length of proposed new temporary roads proposed for both Alternatives B and C would result in immeasurable road density per acre and wildlife should be able to easily avoid them. Temporary roads do not have the same effect as a barrier to wildlife migration as developed, paved roads. Temporary roads may create small breaks in the forest canopy, but these breaks are not wide enough to create a potential threat to species that require large blocks of forest. In fact, temporary roads can provide corridors for wildlife to travel in search of food, mates, or shelter. It is not uncommon to see evidence of moose, bears, coyotes, and amphibians along temporary road corridors.
Timber harvest and prescribed burning activities could harm the habitat for and/or kill individual birds protected by the Migratory Bird Treaty Act.	The harvest activities proposed in both Alternatives B and C enhance migratory bird habitat because they mimic effects of natural disturbance or create a seral stage different from current conditions. Timber harvests enhance habitat for a variety of wildlife including a diverse array of Nearctic-Neotropical migratory songbird species. Timber harvest, just like any natural disturbance that creates forest openings, would inherently alter the habitat of any wildlife using that stand. However, the harvest would provide suitable habitat for other species, including and especially birds. Proposed harvest treatments would not eliminate any one habitat type and thus not eliminate, or detrimentally alter habitat within the project area (Nareff 2020). Further, timing of harvest activities in the winter months to avoid summer breeding season would be applied for most stands. Those available for summer harvest would be delayed until after July 31 or possibly later increasing the chances of completely avoiding incidental take of nestlings or fledglings (Appendix B, Threatened, Endangered and Sensitive Wildlife Species; and Soil and Wetlands). Interior forest birds can also rear their young in regenerating canopy gaps, group selection harvests, or clearcuts, because these areas would provide dense cover and an essentially unlimited supply of insects, seeds, and fruit.
The harvest of old forest could impact their important ecological values.	Age classes defined by the Forest Plan are not ecological descriptors but rather are silvicultural rotation ages. For northern hardwoods the age class for mature and old habitat type is 60 to 119 years of age, and 120+ years of age, respectively (USDA Forest Service 2006a). The northern hardwood habitat type won't start showing old growth characteristics until at least 170 to 200 years old (USDA Forest Service 2006b). Alternatives B and C propose harvest treatments in stands currently in the young, mature, and old age classes. The substantial majority would be in the mature age class with approximately 68 percent and 70 percent of the total acres harvested for Alternatives B and C, respectively (see Section 3.2.4, Table 3-3). Most of the remainder would be in the old age class. Although there are no stands proposed for harvest with existing old growth attributes, these areas would not continue to develop toward late mature status until they regenerate and age well into the future. Approximately 12,000 acres or 41 percent of the total acres suitable for timber harvest would remain in the old forest age class for both alternatives. Additionally, timber harvest is not allowable within wilderness and ecological special areas totaling 4,761 acres or 11 percent of the project area. These areas will continue to age, some beginning to develop old growth characteristics in the next 50 years.
Water Quality and Soil	

Issue Statement	Effects
Mountain bike use could cause soil instability and erosion in the Backcountry Recreation Area. Bike and hiking trail construction within the proposed Backcountry Recreation Area could degrade the Cold Brook watershed.	Trail construction is proposed on 3.9 miles in the backcountry recreation area, which would cover less than one percent of the 928 acres of National Forest System land within the Cold Brook drainage area. Trail construction and use has the potential to adversely compact soils, increase erosion, and cause sedimentation in streams. To minimize potential impacts, project design and mitigation measures are built into the project. The trails would be constructed to Forest Service design standards (National Design Parameters available at http://www.fs.fed.us/recreation/programs/trail-management/trail-fundamentals/. In addition, mountain bike construction would adhere to International Mountain Bicycling Association (IMBA) principles found in *Trail Solutions: IMBA's Guide to Building Sweet Singletrack* (IMBA 2004), and *Managing Mountain Biking: IMBA's Guide to Providing Great Riding* (IMBA 2007). Soil mitigation measures related to mountain bike trail construction (Appendix B, Soil and Wetlands) would reduce potential negative effects to soil and wetland resources to acceptable levels. Water quality effects associated with Cold Brook from proposed mountain bike and hiking trail construction and use would be immeasurable. In addition, on 219 acres of National Forest System land numerous user-created non-system trails within the Cold Brook watershed would be decommissioned and rehabilitated improving soil function and water quality. Trails are expected to be monitored during their use to ensure they are maintained and all soil and water protective features such as dips and water bars are functioning properly.
The Handle Road parking lot and trailhead could increase soil erosion and impact water quality from runoff affecting adjacent land at Bears Crossing.	Water quality effects associated with surface waters within the Bears Crossing development from the proposed Handle Road parking lot and trailhead would be immeasurable. These features would cover less than one tenth of an acre. Although the soil resource would be adversely affected in the parking lot and trailhead footprint, there would be no runoff or sedimentation to adjacent private lands anticipated with Forest Plan standards and guidelines in place to protect stream conditions (Forest Plan, pages 20 and 21).
Human Health	
The application of glyphosate products will have a negative impact on human health.	Alternatives B and C include the use of cut-stump application of glyphosate to control competing tree seedlings or saplings to help establish newly planted oak on up to 221 acres. Risk assessments for glyphosate use and exposure have been prepared (SERA 2011). For each organism or group of organisms assessed, the level of exposure was divided by the level of concern to yield a hazard quotient (HQ). Any HQ less than one indicates a safe level of exposure. Risk characterizations and resource effects disclosed in the Robinson Integrated Resource Project Environmental Assessment are incorporated by reference for application of glyphosate at the proposed application rate of 7.56 pounds of active ingredient per acre without the highly toxic surfactants (USDA Forest Service 2018b). The proposed application of glyphosate is not expected to have an adverse effect for people who may be exposed at treatment sites, because the HQ relevant to the quantitative risk characterization for human health effects is less than one. Mitigation measures are identified to further reduce the risk of unforeseen exposure by signing areas receiving herbicide treatment when sites are in close proximity to areas where recreation use may occur (Appendix B,

Issue Statement	Effects
	Glyphosate Application).
Recreation - User Safety	
The backcountry recreation area could pose safety risks to recreation users.	Safety risks posed to users of the proposed backcountry recreation area would be consistent with accepted risks in similar recreation opportunities across the state and region. There is inherent risk participating in backcountry activities which is acknowledged among the user communities participating in these activities. It should be noted there would be kiosk signage at Handle Road and Mount Snow access points alerting users about the risks, equipment needs, and safety protocols for the area. Forest Service, Vermont Department of Public Safety, local first responders and local trail organization staff have discussed search and rescue concerns, and there is consensus public safety can be adequately addressed.
Recreation – Local Economy	
Decommissioning snowmobile trails could negatively impact local economies.	The 70 miles of existing trail in the project area are part of the over 5,000-mile Vermont Association of Snow Travelers state-wide snowmobile trail system. Snowmobile trails proposed for decommissioning include 4.1 miles, or six percent of the 70 total miles of trail. Negative impacts to local economies resulting from decommissioning this amount of existing snowmobile trails in the project area would be unlikely to occur and would not be measurable. The snowmobile trails proposed for decommissioning are not high-use trails or key to retain important north/south corridors in the area. The Deerfield River Trail has been closed since 2011, when tropical storm Irene washed out a large bridge on the trail. Moving towards a financially and environmentally sustainable snowmobile trail network includes decommissioning trails that have high-cost deferred maintenance and/or have unreliable winter conditions to protect resources. Trails proposed for decommissioning have been identified as having these unsustainable characteristics.
Wilderness	
Management activities could impact the wilderness character of the Glastenbury Wilderness including the “untrammeled” wilderness character quality.	Approximately 4,500 acres of the 22,330-acre Glastenbury Wilderness is within the southeast portion of the project area. Although no management activities are proposed within the wilderness, there are proposed harvest treatments located directly adjacent to its eastern boundary for both Alternatives B and C. Forest Service Manual Chapter 2320 on Wilderness Management prohibits the creation of buffers around wilderness. Project specific mitigation measures would ensure wilderness boundaries are surveyed and appropriately marked wherever timber harvest is proposed adjacent to the boundary (Appendix B, Recreation). Noise from timber sale activities within treatment areas could have short-term impacts to wilderness character in terms of solitude if recreationists are off-trail and close to the wilderness boundary. This would not be considered adverse since effects to solitude would be limited to the time of timber sale operations and to areas in the Glastenbury Wilderness that are adjacent to harvest activities. No management activities are proposed inside wilderness nor would there be an intentional intervention or manipulation of natural processes in wilderness. As stated in *Keeping it Wild 2*, “the

Issue Statement	Effects
	Untrammeled Quality is preserved or sustained when actions to intentionally control or manipulate the components or processes of ecological systems inside wilderness (for example, suppressing fire, stocking lakes with fish, installing water catchments, or removing predators) are not taken" (Landres et al. 2015). There would be no effect to the "untrammeled" wilderness character since no actions (manipulating natural processes or otherwise) are proposed within wilderness.
Inventoried Roadless Areas	
Management activities could impact the roadless character of inventoried roadless areas.	An inventory of roadless areas was conducted during the 2006 Forest Plan revision process. Areas meeting the 1992 Forest Service Handbook (FSH 1909.12 Chapter 7) inventory criteria were identified and evaluated for potential congressional wilderness designation as wilderness. The Glastenbury Inventoried Roadless Area partially overlaps the northwest and southwest portions of the project area. The only vegetation management proposed within the inventoried roadless area for both Alternatives B and C is the continued maintenance of existing permanent upland openings (Compartment 110, Stand 106; and Compartment 93, Stand 107). Since no roads or timber harvest activities would occur, the roadless character would not be changed from current conditions.

3.2 Forest Habitat

This section discloses the change in forest habitat from the proposed action and associated effects to dependent wildlife species.

3.2.1 Issues

Table 3-2 provides the relevant issue (see Chapter 1, Section 1.4), indicator for effects and acceptable effects threshold associated with the forest habitat resource.

Table 3-2. Issue, indicator and threshold for forest habitat resource effects

Issue Statement	Indicator	Threshold
Management activities could alter American marten habitat by shifting the forest stand age class distribution.	The percent of the project area converted to early successional habitat, which martens tend to avoid.	The New Hampshire American marten guideline for no more than 40 percent of the forested landscape should be in early successional or young forest stages is not met (Kilborn unpublished).
Management activities will change the habitat type composition and age class distribution.	The changes in forest habitat type composition and age class distribution are disclosed to determine how well the proposed vegetation management treatments meet the project need to achieve desired conditions (Chapter 1, Section 1.2.1, Tables 1-3 and 1-4; and Table 3-3). How the changes to forest conditions affect associated wildlife habitat are also disclosed.	

3.2.2 Direct and Indirect Effects Analysis Area

The analysis area for direct and indirect effects for forest habitat includes National Forest System lands within the project area (see Map 1, Existing Condition). This area was chosen because these lands are where the proposed management activities would be implemented potentially causing change to terrestrial forest habitats. The temporal context for this analysis includes the short-term (10 years or by 2027), mid-term (50 years), and long-term (over 100 years) scales. The short-term scale reflects the year when the vegetation treatments would be expected to be fully implemented and the immediate impacts of management activities would result in noticeable change. The mid and long-term scales account for management activities or disturbances that may result in changes taking a longer time to detect, such as shifts from hardwood to mixedwood or softwood forest types.

3.2.3 Affected Environment

The existing forest habitat composition and age class distribution, and desired objectives for stand conditions within the project area are provided in Chapter 1, Table 1-3 and Table 1-4, respectively.

Hardwood/Mixedwood/Softwood Habitat

About 75 percent of the habitat type within the project area is northern hardwood which is well above the composition objective of 10 to 20 percent. As a result, the amount of mixed-wood and softwood habitat type are substantially under-represented compared to what would be expected within the range of natural variation for these ecosystems.

There are also approximately 20 acres of non-native softwood plantations including red pine and Norway spruce in the project area. These plantations were planted to stabilize soils and provide habitats in the early twentieth century and are now mature and declining in health.

Aspen and Birch Habitat

The actual presence of aspen or birch habitat on suitable lands within the project area is limited to approximately 339 acres. Most is birch habitat while mature aspen is limited to a few small groups scattered in the southern part of the project area. Stand conditions display diminished growth and declining tree value. Aspen sprouts from its roots when cut and is the most common way for species regeneration. These sprouts provide good early successional habitat for many species, particularly ruffed grouse.

Oak Habitat

Northern red oak is limited to a few stands in lower elevations primarily along the southeast and northeast edges of the project area within Compartments 116, 176 and 183.

Early Successional Habitat

Early-successional habitats include a range of vegetation conditions from grass-forb meadows to openings with young, shrub-scrub, woody vegetation to young stands of tree saplings 10 to 20 feet tall. Early-successional habitat is provided by temporary or silvicultural openings (clearcut, shelterwood, or other regeneration harvest treatments) and permanent upland openings, and represents an extremely important habitat component for wildlife. While climate stress related disturbances such as insect, disease and intense storms could create openings in the future, there is no evidence yet of this occurring. In the last two decades, the only mortality events that resulted in tree death sufficient to create an opening was the creation of new beaver ponds.

Regenerating Age Class

Temporary openings change over time as trees mature, and early successional benefits for wildlife are essentially gone within about 20 years. There are no stands in this class of at least one acre in size within suitable lands for timber management.

Permanent Upland Openings

There are 422 acres of existing, maintained permanent upland openings within the project area. They are maintained in continuous early-successional habitat conditions through regular mowing, other mechanical treatment, or prescribed fire. These openings provide important long-term wildlife and high-quality pollinator habitat.

Apple Trees

Apple trees are located at numerous sites across the project area typically as single trees, small groups of trees, or occasional historic remnant home-site orchards. These apple trees are an important source of wildlife food and are historical forest landscape features. Encroachment from surrounding maturing forest is occurring, which shades the apple trees, and is reducing or eliminating their productivity.

American Marten Habitat

Although there are no federal regulations requiring protection of American marten (*Martes americana*), it is designated as an endangered species in Vermont (VFWD 2015). Widespread deforestation and unregulated harvest of furbearers in the 1800s severely reduced populations. By the early 1900s, the species was deemed extinct in the state. The Vermont Fish and Wildlife Department conducted a re-introduction effort in the southern Green Mountains in the early 1990s. Surveys have confirmed the presence of American martens in the project area. While data are not suitable for population estimates, it is thought there could be 20 to 30 individuals in the population (Braun and Gifford 2019).

American marten in the Northeastern United States use coniferous, deciduous, and mixed forests featuring an interconnected canopy reaching above 30 feet in height. This canopy structure enables tree-to-tree movement offering protection from predators. Resting and den sites are also important for marten survival and may be supplied by large trees and snags, downed wood, and rocks (Lambert et al. 2017). Suitable American marten habitat is distributed extensively throughout the project area. Based on the most recent National Land Cover (Homer et al. 2015) and Forest Service data, most of the project area is forested with 98 percent of National Forest System land and 92 percent of all lands in this condition. Approximately 90 percent of the National Forest System land is dominated by forests in either the mature or old age classes.

3.2.4 Direct and Indirect Effect

Table 3-3 compares the existing age class distribution to 2027 anticipated conditions for Alternatives A, B and C. Forest habitat composition distribution is not expected to measurably change by 2027 for any alternative.

Table 3-3. Comparison of the existing age class distribution of forested stands with 2027 anticipated conditions for Alternatives A, B and C

Age Class (includes all forested habitats)	Existing Condition (2019)		2027 Condition (assumes full implementation)					
			Alternative A		Alternative B		Alternative C	
	acres	*%*	*acres*	*%*	*acres*	*%*	*acres*	*%*
Suitable Lands[1]								
Regenerating (0-9 years)	0	0	0	0	2,850	10	2,716	9
Young	2,653	9	1,037	3	1,036	4	1,036	4
Mature	18,396	62	13,621	46	13,626	46	13,701	46
Old	8,646	29	15,037	51	11,937	41	12,006	41
Total	**29,695**	**100**	**29,695**	**100**	**29,449**[2]	**101**[3]	**29,449**[2]	**100**
All National Forest System Lands								
Regenerating (0-9 years)	0	0	0	0	2,850	7	2,716	7
Young	3,517	9	1,586	4	1,586	4	1,585	4
Mature	20,843	51	15,986	39	15,990	40	16,066	40
Old	16,213	40	23,001	57	19,901	49	19,970	50
Total	**40,573**	**100**	**40,573**	**100**	**40,327**[2]	**100**	**40,327**[2]	**101**[3]

[1] National Forest System lands suitable for timber management and assigned to an even-aged management status prior to project development.

[2] Difference from existing condition is the creation of permanent upland opening on 246 acres.

[3] Total over 100 is due to rounding error

3.2.4.1 Alternative A: No Action

The forest habitat type composition and age class distribution would not move toward desired objectives in the short-term, although general forested composition conditions would slowly transition to ecological site conditions over the long-term.

Hardwood/Mixed-wood/Softwood Habitat

Without vegetation management within the project area, forested communities would be expected to progress toward composition objectives over the long-term (see Table 1-3). Over the short and mid-term, however, conditions would remain out of balance with the ecological tendencies of the landscape. Northern hardwoods would continue to dominate with much smaller amounts of mixed-wood and softwood forest. In the long-term (about 100 years), forest composition would make the slow natural transition from northern hardwood domination to a mix of forest habitat types more suited to ecological site conditions.

Over the short and mid-term, non-native softwood plantations would remain on the landscape. Without vegetation management within these stands, these non-native communities would be expected to die out and progress toward a mix of native species over the long-term.

Oak Habitat

The small amount of oak habitat within the project area would be expected to remain dominant or at least co-dominant in these stands over the short and mid-term, but would decline over the long-term. With no existing regenerating or young oak stands, and no silvicultural treatments to create these conditions, there would not likely be any mature oak-dominated or oak-northern hardwood forest stands after 100 years.

Aspen and Birch Habitat

Even without vegetation management, composition objectives for aspen/paper birch habitat of one to two percent (see Table 1-3) would be met in the short and mid-term. Mature aspen trees scattered throughout the analysis area would continue to age and decline. As time goes on, there would be fewer old aspen trees with enough vigor to send out root suckers as a disturbance response. Thus, opportunities to perpetuate this habitat type within the project area may be lost.

Early-Successional Habitat

Although Alternative A would not include the maintenance of 369 acres of existing permanent upland openings as proposed in the action alternatives, they would still continue to be maintained in the short-term as approved by an existing NEPA analysis and decision (USDA Forest Service 2013).

Potential large-scale openings could be created by wind, drought, or any other disturbances associated with climate related stress, but there is too much uncertainty to enable specific estimates. Given that most stands in the project area are mature even-aged stands with similar land use history, it is expected less than two percent of the age class distribution would be in early-successional habitat resulting from natural disturbance over the mid- to long-term. Once the stands start to break up, more than two percent of the age class distribution could be within the regenerating age class until the stands develop uneven-aged characteristics.

Apple Trees

Apple tree maintenance will still continue on most sites proposed in the action alternatives, because they were approved by existing NEPA analyses and decisions (USDA Forest Service 2017a; and USDA Forest Service 2017b). The exception would be three sites for a total of six acres not approved by the 2017 decisions (Compartment 84/Stand 10, Compartment 99/Stand 47, and Compartment 108/Stand 29). Apple tree productivity at these three sites would continue to decline and the availability and diversity of wildlife food sources within the project area would decrease accordingly. Eventually, many or most of the apple trees currently overtopped in forested stands would die.

American Marten Habitat

Suitable American marten habitat would continue to be abundant within the project area. As forests continue to transition toward maturity, closed canopy would be maintained and the prevalence of snags and downed woody debris used for potential den sites would increase.

3.2.4.2 Alternative B: Proposed Action

Although the change in habitat type composition would be negligible in the short-term (10 years), movement towards objectives would be more noticeable in the mid to long-term (50 to 100 years compared to Alternative A. Changes to the age class distribution would move toward age-class objectives in the short-term (see Table 3-3).

Hardwood/Mixed-wood/Softwood Habitat

The conversion of northern hardwood to mixed-wood or softwood stands would not occur in the short-term. Proposed harvest treatments would transition overall hardwood, mixed-wood, and softwood composition toward composition objectives through natural succession more quickly than in Alternative A with noticeable changes by the mid-term. Northern hardwood would begin to decrease accordingly and reduce its unnatural dominance in the project area. Proposed harvest treatments would also convert 20 acres of non-native softwood plantations to native species. This provides more diverse habitat conditions over the mid-term satisfying the needs of a wider variety of wildlife species preferring softwoods such as Cape May warblers, pine warblers, and red crossbills in a shorter period compared to Alternative A.

Oak Habitat

There would be 221 acres of oak habitat enhancement moving this habitat type closer to composition objectives. This would provide important habitat for multiple wildlife species that consume hard mast including deer, gray squirrel, red squirrel, chipmunk, wild turkey, crow, flying squirrel, rabbit, opossum, blue jay, quail, raccoon, and wood duck.

Aspen and Birch Habitat

There would be a small increase in aspen habitat by clearcutting the scattered mature aspen stands resulting in the likely dominate regeneration of the species through root suckering. Although this would not be enough to substantially change the proportion of aspen from the existing condition, it would slightly increase and maintain aspen habitat within the project area. This would benefit wildlife species dependent on early successional stages of aspen such as ruffed grouse, American woodcock, and chestnut-sided warbler. The aspen and birch habitat would meet composition objectives in the short-term under this alternative, but without continued management in the future it is unlikely it would meet the composition objectives for this habitat over the mid and long-term.

Early Successional Habitat

Temporary Openings

There would be 2,850 acres of 0 to 9-year old age class created from shelterwood and clearcut harvesting (see Table 3-3). This meets the desired age class objectives in the short-term (see Table 1-4). The addition of abundant and well-distributed early-successional habitats would provide an increase of potential territories for wildlife species associated with this habitat. The creation of temporary openings helps create vertical and horizontal structure. This structure reduces vulnerability by providing forest canopy breaks that are less susceptible to insects and more protected from wind disturbance.

The regenerating age class is ephemeral. After 10 years, it would transition to the young age class. Late stage early successional habitat would still exist during the early years of the young age class, but after 20 years would become unsuitable for species requiring this habitat type. Over the mid to long-term, if no additional forest management is conducted to regenerate forested stands, only natural disturbance created habitat would remain to meet this habitat need.

Permanent Upland Openings

Creation of seven new permanent upland openings (152 acres) and expansion of five existing permanent upland openings (94 acres) would produce an additional 246 acres of this habitat type. When added to the existing openings not proposed for expansion, there would be a total of 615 acres of this important early successional habitat in the short-term.

There would be a diversity of permanent upland openings in terms of opening size and structural diversity of habitat. The addition of larger opening sizes would provide habitat for bird species dependent on larger openings such as, bluebirds and potentially bobolinks. Openings greater than four acres have been found to provide habitat for a large diversity of bird and other wildlife (Fuller and DeStafano 2003) including many neotropical migratory birds considered to be interior forest species (Stoleson 2013). Additionally, patches of shrubs, trees, mast trees, apple trees, and snags in permanent upland openings (Forest Plan, page 27) increases the diversity of habitats and improves cover, food, and breeding opportunities for a wide range of wildlife species. These openings would help enhance and increase the availability of higher quality habitat for pollinator species.

Apple Trees

Apple production would continue within nine known project area sites for a total of 18 acres. Proposed apple tree treatments would perpetuate and improve an existing wildlife food resource otherwise subject to decline and loss over time.

American Marten Habitat

Although the proposed forest management activities would create a more diverse forest landscape, there could be effects to individual American martens through disturbance or removal of mature forest stands. Due to the small population size within the project area, the likelihood of such effects is low. Early successional habitat would be established on 3,096 acres (7.8 percent of the total forested landscape within the project area) while mature and old forests would be retained on approximately 89 percent of National Forest System land (see Table 3-3). A detailed spatial effects analysis for the proposed timber harvests on marten home ranges concluded 94 percent of the project area would remain suitable for this species (Braun and Gifford 2019). Large expanses of wilderness and mature forest are adjacent to the project area. Silvicultural treatments will not occur within the wilderness and are not anticipated on non-wilderness areas in the foreseeable future. Given the small population size of American martens and the retention of vast areas of the forested landscape retained in mature stages, adverse impacts to martens or their habitat in the project area are unlikely because the amount of early successional habitat created would be well below the 40 percent threshold.

3.2.4.3 Alternative C: Reduced Roads

Although Alternative C would reduce overall harvest treatments by 683 acres compared to Alternative B, the change in habitat type composition and age class distribution would be similar (Table 3-3). Most reductions would be uneven-aged harvest treatments (453 acres or 66 percent of the total harvest reduction), thus would not contribute change to the age class distribution within the Somerset project area compared to Alternative B.

There would be 2,962 acres of early successional habitat established from timber harvest treatments or 7.4 percent of the total forested landscape within the project area. Although this is 134 fewer acres compared to Alternative B, the difference in effects associated with American marten habitat is negligible.

3.2.5 Cumulative Effects

The cumulative effects analysis area includes all lands within the project area. This spatial context was used because the area covers the proposed management activities as well as past, present or foreseeable future harvest activities on non-National Forest System lands. Collectively, these activities could cause potential terrestrial forest habitat changes. The temporal context for the analysis is the same as for the direct and indirect effects, but it also considers past (last 10 years) harvest activities.

The last harvesting to occur on National Forest System lands within the analysis area were sales in the 1990s which is beyond the cumulative analysis timeframe. All of the regenerating age class and most of the early-successional habitat resulting from those past harvests has been lost to natural succession into the young age class. There are no Forest Service timber harvests planned for the next 10 years within the analysis area beyond those associated with this project.

Small amounts of vegetation management have occurred on state and private lands in the past 10 years within the analysis area. Management is anticipated to continue on these non-National Forest System lands but in minimal amounts. The cumulative effect on forest habitat composition and age class from these projects would be negligible because the amount of activity on private and state lands is so low. Cumulative effects to American marten habitat beyond the direct and indirect effects would likewise be negligible given the small scale of overlapping management activities in the project area.

Early Successional Habitat - Vermont Conservation Design Goals

The Forest Plan objectives for early successional habitat (0 to 9-year old regenerating age class) for the northern hardwood habitat type is between 5 to 10 percent within management areas where suitable acres of even-aged timber management is allowable. The Vermont Conservation Design provides a state-wide goal of 3 to 5 percent of young forest for maintaining an ecologically functional landscape (Sorenson and Zaino 2018). Based on the goal range, between 22,000 to 30,000 acres within the Southern Green Mountain Biophysical Region is suggested. This region includes most of the Manchester Ranger District (except for areas in the Taconic Mountains) and the southern and western parts of the Rochester Ranger District, and thus is the cumulative effects analysis area specific to the young forest goal.

Determination of acres with forest conditions less than 15 years old on National Forest System lands is based on timber harvest activities incurred during the cumulative effects analysis timeframe (Braun 2020). Considering the harvest proposed in both Somerset project action alternatives together with other Green Mountain National Forest timber sale activity[5], the acres in the 0 to 15-year old age class would not exceed two percent of the Southern Green Mountain Biophysical Region. Minimal amounts of regenerating harvest have occurred or is projected on state lands within this region. Although no early successional habitat was detected from Forest Inventory and Analysis survey plots on private land, it is assumed these lands include small amounts of early successional habitat. It is difficult to ascertain actual future timber harvest activity on private land based on management plans prepared under the state Current Use Program (32 V.S.A. part 3757), but it is assumed the amount would be minimal. Considering the small amount of regenerating harvest activity on non-federal lands within the region, the acres in the 0 to 15-year old age class would still likely not exceed two percent.

3.3 Forest Health

This section discloses the effects associated with forest health including forest productivity and non-native invasive plants.

3.3.1 Issues

Table 3-4 provides the relevant issue (see Chapter 1, Section 1.4), indicator for effects and acceptable effects threshold associated with ecosystem health.

Table 3-4. Issue, indicator and threshold for effects related to forest health

Issue Statement	Indicator	Threshold
Timber harvest activities, including temporary road construction and use could introduce and spread non-native invasive plant species.	The potential to increase non-native invasive plant occurrence within the project area is the extent of known infestations adjacent to or overlapping proposed harvest and road construction activities, in combination with the species-specific problems they can cause.	Non-native invasive plants increase in stands where vegetation management occurs, to the extent project goals cannot be met, or other forest resources, including rare plant species, would be negatively affected.

[5] Nordic Integrated Resource Project (2006), Natural Turnpike Project (2008), Dorset-Peru Integrated Resource Project (2013), Gilmore Aspen (2015), South of Route 9 Integrated Resource Project (2016), Early Successional Habitat Creation Project (2019), and Telephone Gap Integrated Resource Project (expected in 2022)

Issue Statement	Indicator	Threshold
	These factors are combined to develop a risk rating (USDA Forest Service 2003) to ascertain the risk of introducing, establishing, or spreading invasive species associated with proposed activities, and to provide the needed measures to reduce or eliminate the risk.	This threshold could be reached if necessary measures to reduce or eliminate risk were either not followed or not effective.
Management activities will change forest conditions relative to health and productivity.	Although not identified as a public issue, the change in forest conditions relative to health and productivity are disclosed to determine how well the proposed vegetation management treatments meet the project need (Chapter 1, Section 1.2.1).	

3.3.2 Direct and Indirect Effects Analysis Area

The spatial analysis area for the direct and indirect effects for non-native invasive plants and forest productivity includes all sites where proposed vegetation management and other activities would occur. For non-native invasive plants, this includes all travel corridors proposed for use in implementing the proposed activities. The temporal analysis scale is 10 years, since it represents the time period when all proposed activities would be expected for full implementation and result in noticeable change.

3.3.3 Affected Environment

Non-native Invasive Plants

Habitat types in the project area include forested stands, maintained openings, rivers and streams with their associated riparian areas, and a variety of wetlands. Surveys for non-native invasive plants occurred from 2017 to 2019, wherever surveys or monitoring for rare plants occurred. Surveys also occurred along a number of potential pathways of dispersal such as roads or trails. Mitigation measures would require additional surveys for all existing or proposed log landings, and other sites where activities are proposed prior to implementation (Appendix B, Non-native Invasive Plants).

Although not all of the project area has been inventoried for non-native invasive plants, it is relatively un-infested compared to many places on the Green Mountain National Forest likely due to its remoteness. Exceptions include some of the areas most heavily used for recreation, such as along Forest Road 71 and the Somerset Airfield. The majority of known infestations occur along habitat edges such as roads, trails, and streams as opposed to forest interiors.

Non-native invasive plant species documented in the project area are listed in Table 3-5. These species vary in terms of their distribution, number and size of infestations, and the kinds of problems they pose. At least some infestations of each species either overlap or are adjacent to proposed activities.

It is likely some non-native invasive plants more southern in their distribution may start to establish in Vermont if climate conditions continue to warm. Examples include Japanese stiltgrass, which is now questionably present in southern and western Vermont, and kudzu, which is still farther away. It is unknown exactly what species would spread into the Somerset project area over time, since different species interact with the environment in different locations.

Forest Productivity

Existing forest stand conditions within the project area range from immature overstocked stands to mostly mature, over mature, and low-quality hardwood, mixed wood, and softwood stands. General forest conditions exhibit a preponderance of low-quality trees and are declining in productivity due to weather, insect and disease. The review of relevant research and reports associated with timber management and

climate change indicates climate change will have an influence on vegetation, water, disturbance frequencies, and forest pests in the Northeast including the Green Mountain National Forest (Bose et al. 2017; Janowiak et al. 2018). Although it is difficult to predict what changes will occur and when they might appear on the landscape, maintaining optimal forest and tree health is widely supported to buffer climate change influences on resources. The diversity of species composition, age, and structure are several factors affecting forest ecosystem resiliency to stressors triggered by climate change.

Of particular concern is the presence of beech bark disease common on nearly all beech trees in the project area. The disease is inflicted by a scale insect allowing Nectria fungus to establish in the wounds created by insect feeding activity. The fungus eventually girdles the tree and causes death. Beech sprouts from the roots of dead trees and often shade out other understory vegetation including sugar maple regeneration (Bose et al. 2017; Collin et al. 2017). Many mature beech in the project area have been killed by the disease resulting in abundant beech sprouts in many areas of the forest. Climate change stressors such as increased temperature and precipitation over the last 25 years have also increased the amount of beech regeneration relative to regeneration of other tree species (Bose et al. 2017). There are small numbers of disease resistant beech trees still present, but they are declining quickly.

3.3.4 Direct and Indirect Effect

3.3.4.1 Alternative A: No Action

Non-native Invasive Plants

Even with the absence of proposed management activities, non-native invasive plants would still occur in all locations where they are currently known, would not likely be prioritized for treatment, and would have the effects described in Table 3-6. Existing infestations would continue to spread by natural means such as water, wind, wildlife, and current ongoing management activities. Given the current level of infestations of non-native invasive plants combined with ongoing natural and human-caused disturbances, it is possible known infestations would get worse. As a result, other forest resources such as tree regeneration, rare plant viability, and wildlife habitat quality may be increasingly negatively affected over time.

Forest Productivity

There would be no vegetation management on National Forest System lands within the project area. Forest productivity and stand conditions where treatments are proposed would continue to decline and exhibit mortality from insects, disease, competition, wind throw and ice damage. Beech bark disease would continue to proliferate, and beech sprouts would continue to compete with other understory vegetation decreasing the diversity in forest composition. Increased disturbances such as wind events and ice storms may occur in the Northeast from climate change (Janowiak et al. 2018). Such events could result in overstory tree mortality and accelerate the trajectory toward stunted and diseased beech forest.

3.3.4.2 Alternative B: Proposed Action

Non-native Invasive Plants

Sites where proposed activities either overlap with or are adjacent to known infestations would create conditions that could facilitate the establishment and spread of non-native invasive plant infestations increasing the potential effects described in Table 3-6. The primary direct effects result from wheeled or tracked equipment moving seeds or other viable plant propagules from one location to another. Indirect effects result from potential ground disturbance and increased light reaching the ground, thus increasing opportunities for non-native invasive plants to become established in new locations. New temporary roads and skid trails can also serve as pathways of dispersal for non-native invasive plants.

Table 3-5. Non-native invasive plants in the Somerset project area and their potential effects

Species	Potential Effect
Bishop's goutweed (*Aegopodium podagraria*)	• Aggressive in forming dense patches, displacing native species, and reducing plant species diversity in the ground layer • Infestations inhibit establishment of a variety of native trees, including conifers (Plant Conservation Alliance Alien Plant Working Group, 2005a)
Garlic mustard (*Alliaria petiolata*)	• Suppresses native plant growth by disrupting associations between tree seedlings and belowground arbuscular mycorrhizal fungi (Stinson et al. 2006). • Releases allelopathic chemicals that can cause substantial harm to native plant communities, including persistent effects to soil (Evans et al. 2014), which can inhibit tree regeneration
Wild chervil (*Anthriscus sylvestris*)	• Its height and aggressive growth allow it to shade out native vegetation (University of Vermont Extension, undated).
Japanese barberry (*Berberis thunbergii*)	• Dense infestations are associated with a lack of desirable tree regeneration • May alter nitrogen cycling and thereby affect soil biota, structure, and function (Kourtev et al., 1999, Ehrenfeld et al., 2001, and Kourtev et al., 2003 in Ward et al., 2009); effects likely to persist and may hamper the restoration • Deer tick populations are reportedly twice as numerous in barberry-infested forests compared to adjacent forests without barberry (Elias et al., 2006 in Ward et al., 2009); ticks are the major vectors for disease agents that cause Lyme and other diseases
Narrowleaf bittercress (*Cardamine impatiens*)	• Produces many seeds per plant; can form dense stands invading woodland habitats and outcompete native species (University of Vermont Extension, undated)
Spotted knapweed (*Centaurea maculosa*)	• Spreads rapidly, displacing native vegetation and reducing the amount of available forage for wildlife and livestock • May degrade soil and water resources by increasing erosion and surface runoff
Autumn olive (*Elaeagnus umbellata*)	• Threatens natural communities by out-competing and displacing native plant species, creating dense shade underneath which little else will grow, and interfering with natural plant succession and nutrient cycling (Swearingen et al. 2010) • Disturbed ground and increased light could facilitate expansion of existing infestations, which could compete with regenerating trees
Glossy buckthorn (*Frangula alnus*)	• Particularly aggressive in wet areas, rapidly producing a dense shade that eliminates native plants • Engages in species-specific allelopathy, changing the structure of native plant communities (University of Vermont Extension, undated)
Morrow honeysuckle (*Lonicera morrowii*)	• Rate of growth of forest over-story trees may be lower in invaded versus uninvaded sites (Hartman and McCarthy, 2007) • Could impede desired tree regeneration • Competes with native plants for sunlight, moisture and pollinators • Fruit has poor nutritional quality for migrating birds (University of Vermont Extension, undated)
Purple loosestrife (*Lythrum salicaria*)	• Can quickly form dense stands in wetlands, completely dominating an area to the exclusion of native vegetation, and altering ecosystem structure and function • Hybridizes with native a loosestrife species, potentially depleting the native species gene pool (University of Vermont Extension, undated)
Wild parsnip (*Pastinaca sativa*)	• Invades and modifies open disturbed habitats; once there, it can form dense stands
Japanese knotweed (*Polygonum cuspidatum*)	• Thickets can clog small waterways, displace streamside vegetation, increase bank erosion, and lower the quality of riparian fish and wildlife habitat
Multiflora rose (*Rosa multiflora*)	• Readily invades open habitats where the ground has been disturbed, often forming impenetrable thickets that exclude native plant species (Plant Conservation Alliance Alien Plant Working Group 2005b)

Implementing the proposed activities consistent with Forest Plan standards and guidelines would help prevent non-native invasive plants from being introduced to project sites. In addition, Forest Service Manual 2900 directs the Forest Service to determine the risk of introducing, establishing, or spreading invasive species associated with any proposed action and to provide alternatives or mitigation measures to reduce or eliminate risk prior to project approval.

Mitigation measures have been developed to minimize the effects from non-native invasive plants associated with proposed management activities (Appendix B, Non-native Invasive Plants). Survey results inform a risk rating and necessary subsequent actions for each site to minimize the spread of infestations as much as possible (USDA Forest Service 2003). Risk ratings would be completed prior to implementation of proposed ground disturbing activities. The type and degree of mitigation measure in any given location is based a combination of which non-native invasive species occur there, their distribution (such as dense thickets, scattered patches, or occasional individuals), and how they are likely to respond given the proposed treatment. In general, the higher the risk rating, the more aggressive the mitigation measure. It should be noted that none of the mitigation measures would entirely prevent or eliminate problems for a variety of reasons. If mitigation measures are followed in keeping with the risk rating and determination of action, the chance of reaching the threshold of non-native invasive plants having an unacceptable adverse effect on resources can be reduced.

Forest Productivity

Harvest treatments would remove over-mature, high risk, defect, or diseased trees, while retaining the most healthy and vigorous trees. Overall forest productivity and conditions would be improved within proposed harvest treatment stands by the following:

- Regenerating poorly stocked, low quality, mature stands, and stands declining in productivity to grow new stands, sustain forest cover and timber production for the long-term
- Providing new early-successional seedling-sapling and upland opening habitats
- Removing monotypes and non-native trees found in plantations and converting to native tree species
- Promoting an increase in softwood and mixedwood habitats by releasing spruce/fir and hemlock from competing hardwoods

Beech bark disease would be reduced on about 7,624 acres increasing future forest habitat functionality and resiliency. The reduction of beech as a component in stands would allow other tree species to grow to maturity and provide cavities (DeGraaf et al. 2005), large snags, downed wood, range of wildlife food sources, and valued timber for future wood products.

3.3.4.3 Alternative C: Reduced Roads

Non-native Invasive Plants

Alternative C consists of 14.3 fewer miles of temporary road construction and 683 fewer acres of timber harvest treatments compared to Alternative B. This difference results in fewer pathways of dispersal for non-native invasive plants, and less ground disturbance that could facilitate their establishment. Since many of the surveys for non-native invasive plants would have occurred just prior to project implementation as part of mitigation measures (Appendix B, Non-native Invasive Plants), it is not possible to compare the number of infestations or acres of infestations that could be potentially dispersed in Alternative B versus Alternative C.

Forest Productivity

Harvesting treatments would reduce beech bark disease on 6,975 acres, which is 649 fewer acres than Alternative B. Although this reduction would lead to more beech nuts available in the untreated areas as compared to Alternative B, the decrease in treatments would be less effective at reducing the amount of beech within the project area. There would also be fewer acres of future mature forest habitat and fewer acres with increased tree species diversity across the forested landscape.

3.3.5 Cumulative Effects

The cumulative effects analysis area includes locations where non-native invasive plants occur within or immediately adjacent to the Somerset project area, because these locations are the focus of the current model for non-native invasive plants risk assessments (R9 Regional Leadership Team, 2003). Any activity that disturbs ground, increases the amount of light reaching the soil, or involves the movement of equipment from sites where non-native invasive plants occur to sites not infested has the potential to increase negative effects on other resources (USDA Forest Service 2012a). Since disturbances spreading non-native invasive plants or increase the chance of infestations are ongoing, no timeframe is defined for the analysis.

Other than anecdotally noted during routine travel within the project area, the occurrence and extent of non-native invasive plant infestations on state and private lands within the project areas is not known. There is no timber harvest or other management activities anticipated on National Forest System lands within the analysis area beyond those proposed and there are no known major activities planned for state or private lands. Thus, the cumulative effects associated with non-native invasive plants would be immeasurably different than those disclosed for direct and indirect effects.

The occurrence and extent of existing non-native invasive plant infestations on state and private lands within the project areas is not known. Given there are no Forest Service harvest or other management activities anticipated beyond those proposed, and there are no known major activities planned for state or private lands, the cumulative effects associated with non-native invasive plants would be immeasurably different than those disclosed for direct and indirect effects. The Forest Service has the ability to assist in the control of known or new non-native invasive plant infestations on adjacent land in cooperation and agreement with the landowner (USDA Forest Service 2014). To the extent other landowners are interested in working collaboratively, this can further mitigate potential cumulative effects related to the spread of infestations across landowner boundaries.

3.4 Threatened, Endangered and Sensitive Wildlife

Threatened, endangered, and sensitive wildlife collectively include species federally listed as threatened or endangered under the Endangered Species Act as well as Regional Forester Sensitive Species. Regional Forester Sensitive Species, referred to as “sensitive” species in this section, include species identified by the Forest Service for which population viability is a concern.

The biological evaluation prepared for the Somerset project (Nareff 2020b) is summarized in this section to describe the affected environment and disclose the environmental effects for threatened, endangered, and sensitive wildlife species.

3.4.1 Issues

Table 3-6 provides the relevant issues (see Chapter 1, Section 1.4), indicators for effects and acceptable effects thresholds associated with threatened, endangered and sensitive wildlife species.

Table 3-6. Issue, indicator and threshold for effects related to threatened, endangered and sensitive wildlife

Issue Statement	Indicator	Threshold
Management activities could impact threatened or endangered wildlife species.	Changes to northern long-eared bat foraging, roosting, and hibernating habitat; cutting of trees during sensitive time periods which would risk direct take of individuals.	Actions or habitat changes which do not meet agency responsibilities required by the Endangered Species Act Section 7(a)(2) and the Final 4(d) Rule relative to the northern long-eared bat.
Management activities could impact sensitive wildlife species.	Relative changes in the amount, distribution, and overall availability of suitable habitats for affected species.	Management activities result in a loss of population viability or trend toward federal listing for any sensitive wildlife species on the Green Mountain National Forest (Forest Service Manual 2670).

3.4.2 Direct and Indirect Effects Analysis Area

The analysis area for direct and indirect effects for threatened, endangered and sensitive wildlife species is all suitable habitats located within the Somerset project area. This analysis area includes the locations of proposed management activities that may have an impact on these species or their habitats. The temporal context for this analysis is 10 years, because this is the time period expected to encompass full implementation of proposed vegetation treatments and realize the effects on habitat conditions.

3.4.3 Affected Environment

Threatened and Endangered Species

The federally listed threatened and endangered species known to occur on or near the Green Mountain National Forest are provided in Table 3-7.

The Green Mountain National Forest has only historical occurrence records for the gray wolf. This species is not known to occur on the Forest, and its presence at any time in the near future is unlikely. A breeding population of the Canada lynx was recently discovered in northern Vermont and while individuals were observed wandering as far south as the project area in 2016, a camera trapping effort (2016 to 2018) did not indicate a resident population and was unable to document lynx on National Forest System land. It is highly unlikely southern Vermont can support a breeding population. Moreover, project activities would not take place in the Canada lynx's preferred habitat. Indiana bats occur on and near the Green Mountain National Forest, although they are unlikely to occur in the project area due to the elevation and distance from known Indiana bat hibernacula. Considering their low likelihood of occurrence in the project area, the gray wolf, Canada lynx, and Indiana bat are not included further in this analysis.

Table 3-7. Species listed as threatened or endangered under the Endangered Species Act (ESA) with current or historic occurrence on the Green Mountain National Forest and likelihood of occurrence in the Somerset project area

Common Name	Scientific Name	ESA Status	Status on Forest	Likelihood of Occurrence in Project Area
Gray wolf	*Canis lupus*	Endangered	Extirpated	Low
Canada lynx	*Lynx canadensis*	Threatened	Extirpated	Low
Indiana bat	*Myotis sodalis*	Endangered	Current	Low
Northern long-eared bat	*Myotis septentrionalis*	Threatened	Current	High

Northern long-eared bats are more closely associated with forested lands than other northeastern woodland bats. These bats typically roost in cavities in live or dead hardwood trees and under the loose bark of dead, standing trees. They forage primarily in forested areas, below the tree canopy, in openings, and around water bodies where flying insects congregate. The Green Mountain National Forest including the project area provide suitable foraging and roosting habitat for northern long-eared bats.

Mist-net survey data confirm before exposure to white-nose syndrome[6], the northern long-eared bat was once widely distributed across the Green Mountain National Forest although scattered and probably never abundant. In 2011, it was estimated as a consequence of white-nose syndrome, northern long-eared bats have declined by 93 to 99 percent in Vermont (Darling and Smith 2011). While the Forest Service is not required to conduct field surveys to determine if hibernacula or maternity roost trees are within the action area of a project, the agency is expected to diligently find and review any and all available data.

There is one hibernaculum with known northern long-eared bat activity within the Somerset project at the Dover Iron Mine located on the east slope of Mount Snow. Acoustic surveys were conducted for the presence of northern long-eared bats within the Somerset project area in 2017, 2018, and 2019 (Monahan 2018, Bennett 2018 and 2019). These surveys detected northern long-eared bats at four sites. From the results of the acoustic surveys, sites were chosen to mist net bats in 2018. No northern long-eared bats were captured during the mist-net surveys.

Regional Forester Sensitive Species

There are 20 wildlife species on the Regional Forester Sensitive Species list for the Green Mountain National Forest. The project area does not provide the specialized types of habitats suitable for or required by some of these species, the elevation is too high, or the nearest known occurrences of the species are geographically distant from the area. Table 3-8 provides the likelihood of occurrence in the project area for each species.

Table 3-8. Likelihood of occurrence for Regional Forester Sensitive Species within the Somerset project area

Common Name	Scientific Name	State Conservation Rank[1]/Status[2]	Likelihood of Occurrence in Project Area
Eastern small-footed bat	*Myotis leibii*	S1/Threatened	Moderate
Little brown bat	*Myotis lucifugus*	S1/Endangered	High
Tri-colored bat	*Perimyotis subflavus*	S1/Endangered	High

[6] White-nose syndrome is an emergent disease of hibernating bats spreading from the Northeastern to the Central United States. The disease is named for the white fungus, *Pseudogymnoascus destructans*, infecting skin of the muzzle, ears, and wings of hibernating bats.

Common Name	Scientific Name	State Conservation Rank[1]/Status[2]	Likelihood of Occurrence in Project Area
Common loon	*Gavia immer*	S3	High
Peregrine falcon	*Falco peregrinus anatum*	S3	High
Bicknell's thrush	*Catharus bicknelli*	S2/Special Concern	High
Rusty blackbird	*Euphagus carolinus*	S3/Special Concern	Moderate
Wood turtle	*Clemmys insculpta*	S3/Special Concern	Low
Spotted Turtle	*Clemmys guttata*	S1/Endangered	Low
Jefferson salamander	*Ambystoma jeffersonianum*	S2/Special Concern	Low
Blue-spotted salamander	*Ambystoma laterale*	S3/Special Concern	Low
Four-toed salamander	*Hemidactylium scutatum*	S2/Special Concern	Moderate
Brook floater	*Alasmidonta varicosa*	S1/Threatened	Low
Creek heelsplitter	*Lasmigona compressa*	S2	Low
Appalachian tiger beetle	*Cicindela ancocisconensis*	S1	Low
West Virginia white	*Pieris virginiensis*	S3/S4/Special Concern	Moderate
Yellow-banded bumble bee	*Bombus terricola*	S2/S3	Low
Monarch butterfly	*Danaus plexippus*	S5/Declining	High
Harpoon clubtail	*Gomphus descriptus*	S3	Low
Southern pygmy clubtail	*Lanthus vernalis*	S3	Moderate

[1] Conservation ranks provide an informational assessment of extinction risk based on factors such as abundance, distribution, population trends, and threats. State ranks are assigned by the Vermont Nongame and Natural Heritage Program to reflect the rarity of the species within the state of Vermont. For avian species, the ranks apply to breeding status only. S1= critically imperiled; S2=imperiled; S3=vulnerable to extirpation or extinction; S4=apparently secure; S5=demonstrably widespread, abundant, and secure.

[2] Vermont State Status has two categories afforded legal protection under the Vermont Endangered Species Law (10 V.S.A. Chapter 123), endangered and threatened. The additional informational category of special concern is not established by law but used to track rare species (VNHI 2017).

The nine sensitive species with low likelihood of occurrence are not considered further in this analysis since it is not anticipated there would be any adverse effect to them or their associated habitat from the proposed activities.

Little Brown Bat, Eastern Small-footed Bat, and Tri-colored Bat

Three sensitive species of woodland bats occur on and near the Green Mountain National Forest. Prior to white-nose syndrome, little brown bats were widespread and abundant on the Forest and surrounding areas, and in New England in general, ranked as "common" and "secure" in Vermont. The eastern small-footed bat and tri-colored bat always have been considered uncommon or rare on the Forest and in Vermont. The project area provides foraging and roosting habitat for all three species, and tri-colored bats and little brown bats are known to use the Dover Iron Mine hibernaculum. Acoustic surveys and mist-netting in the project area resulted in several detections and captures of little brown bats (Monahan 2018).

Common Loon and Peregrine Falcon

The common loon and peregrine falcon both occur within the project area in low numbers. These species rely on specific habitat excluded from the proposed treatments due to Forest Plan standards and

guidelines for the protection of water bodies (common loon) or rocky cliff faces with active nests (peregrine falcon). Given the very low likelihood of overlap in impacts from the proposed action on these sites, these species are not discussed further.

Bicknell's Thrush

The Bicknell's thrush is found across the Green Mountain National Forest in high-elevation balsam fir-red spruce stands. Highest densities are typically found in stands of dense, regenerating balsam fir on exposed ridgelines or along edges of human-created openings (Rimmer et al. 2005). Bicknell's thrushes were detected during high elevation breeding bird surveys conducted within the project area between 2000 and 2010 including portions of Deerfield Ridge adjacent to the proposed backcountry ski zones (VCE 2015). Approximately 570 acres of dense stands of young balsam fir along Deerfield Ridge are considered occupied suitable nesting habitat. This is the only area of suitable habitat within the project boundary impacted by the proposed action.

Monarch Butterfly

Monarch butterflies prefer open fields and meadows with milkweed. There are suitable patches of monarch habitat located within the project area including managed permanent upland openings, non-system woods roads, and skid trails. Recent emphasis on monitoring and management of pollinator habitat has resulted in improved conservation of flowering plants in the project area.

Rusty blackbird, four-toed salamander, West Virginia white, and southern pygmy clubtail

The rusty blackbird, four-toed salamander, West Virginia white, and southern pygmy clubtail have been documented in the project area through historic incidental observations but are likely limited in distribution with very low numbers of individuals.

3.4.4 Direct and Indirect Effects

3.4.4.1 Alternative A: No Action

Most changes in habitat conditions on National Forest System lands within the project area for Alternative A would take place through natural processes such as wind and ice storms, fire, beaver activity, floods, insects and disease, and natural forest succession. Changes to habitat conditions for threatened, endangered, and sensitive wildlife species, and effects to individual animals would be negligible.

3.4.4.2 Alternative B: Proposed Action

There would be "No Effect" on gray wolf, Canada lynx, and Indiana bat, because of the low likelihood of occurrence for these species in the project area.

On 14 January 2016, the U.S. Fish and Wildlife Service finalized a rule under the authority of Section 4(d) of the Endangered Species Act (Final 4(d) Rule) providing measures necessary and advisable to promote the conservation of the northern long-eared bat (USFWS 2016a). According to the Final 4(d) Rule, incidental take[7] of northern long-eared bat from activities occurring within the white-nose syndrome zone, including the Green Mountain National Forest, is prohibited only under the following conditions:

[7] As defined in the Endangered Species Act, take means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Incidental take of federally listed species is used to describe take that is unintended and not the purpose of carrying out an otherwise lawful activity. If it is determined a project could or will result in prohibited incidental take, formal consultation with the United States Fish and Wildlife Service is required.

1. It occurs within a hibernaculum
2. It results from tree removal activities
   - And, the activity occurs within 0.25 mile (0.4 km) of a known hibernaculum
   - Or, the activity cuts or destroys a known, occupied maternity roost tree or other trees within a 150-foot radius from the maternity roost tree during the pup season from June 1 thru July 31

Given no timber removal activities would occur within one mile of known northern long-eared bat hibernacula and the absence of known maternity roost trees within the project area, any incidental take resulting from tree removal at any time of the year is allowed. Although project activities do not result in conditions for prohibited incidental take under the Final 4(d) rule, there still exists the possibility of direct (removal of occupied maternity roost trees) and indirect (removal of roost trees while unoccupied) effects to the northern long-eared bat.

A variety of management actions would affect vegetation therefore altering habitat conditions within the project area. Some actions proposed, primarily timber harvest operations and road building could take place during non-winter conditions. These include up to 807 acres of treatments in stands feasible for summer harvest activities which represents about two percent of forest on National Forest System land within the project area. The determination for these actions would be *Likely to Adversely Affect* (LAA) northern long-eared bat, because they could remove potential occupied roost trees.

Many other project activities, such as trail and road construction or maintenance, would involve the removal of trees but would do so either in very small numbers or when bats are most likely in hibernation and therefore not on the landscape during winter months. Effects to the species, specifically the potential removal of unoccupied maternity roost trees during the winter, are indirect. The determination for these actions would be *May Affect, Not Likely to Adversely Affect* (NLAA) northern long-eared bat because effects would be discountable (extremely unlikely to occur) or insignificant (undetectable, not measurable, or so minor that they cannot be meaningfully evaluated).

The Vermont Fish and Wildlife Department developed forest management guidance for protecting northern long eared-bats and their habitat (VFWD 2017). The purpose of the guidance is to maintain suitable hibernating, roosting and foraging habitat within established Special Management Zones. For purposes of this project, conservation measures would be required between 0.25- and 1.0-mile radius of Dover Iron Mine (Special Management Zone 2) and within maternity colony zones if northern long-eared bats are detected (Appendix B, Threatened, Endangered and Sensitive Wildlife Species). No project activities are proposed within 0.25 mile of the Dover Iron Mine. Less than one mile of non-motorized trail on the south side of Mount Snow is proposed within a 1.0-mile radius of the mine. Any tree cutting associated with trail construction in this area would not occur between April 1 and October 31.

For projects that may affect the northern long-eared bat (LAA and NLAA determinations) but do not cause prohibited take, the Forest Service would implement the Final 4(d) Rule using the voluntary framework identified in the U.S. Fish and Wildlife Service range-wide Biological Opinion (USFWS 2016b). This process satisfies the Forest Service's responsibilities under the ESA Section 7(a)(2) and the Final 4(d) Rule relative to the northern long-eared bat. Plans for implementing timber harvest treatments and other actions which require cutting trees have further protections for avoiding direct take of northern long-eared bat individuals (and individuals of other tree-roosting bat species) through time of year restrictions which are expanded later into fall in specific locations if bats are detected by acoustic survey (Appendix B, Threatened, Endangered and Sensitive Wildlife Species). While some treatments would temporarily reduce the number of roosting trees available to northern long-eared and other bats, the

species are not limited by summer habitat and treatments to improve forest health would benefit the species in the long-term (Final 4(d) Rule). Further, foraging habitat would be improved by the proposed creation and maintenance of forest openings.

Northern long-eared bat determinations are based on the application of conservation measures and management guidelines including applicable Eastern Region, Forest Service conservation measures (USFWS 2015), and applicable state management guidelines for management of northern long-eared bat developed in conjunction with Forest Service biologists (Appendix B, Threatened, Endangered and Sensitive Wildlife Species). In addition, a number of Forest Plan standards and guidelines designed to benefit the Indiana bat and other wildlife would also foster conservation of the northern long-eared bat within the project area including those concerning wildlife reserve trees, snags, den and nest trees, and mast trees.

Regional Forester Sensitive Species

With the application of Forest Plan standards and guidelines and mitigation measures (Appendix B, Threatened, Endangered and Sensitive Wildlife Species), there would be no effect likely causing a trend toward federal listing or loss of viability for any of the sensitive species within the project area.

Little Brown Bat, Eastern Small-footed Bat, and Tri-colored Bat

There could be effects to individual little brown bats, eastern small-footed bats, or tri-colored bats through disturbance, injury, or removal of roost trees. The likelihood of such effects is low, due to the additional conservation measures applied for northern long-eared bats, as these measures would also benefit the three sensitive bat species (Appendix B, Threatened, Endangered and Sensitive Wildlife Species). In addition, the established Forest Plan standards and guidelines specific to bats and other wildlife and the emphasis on winter timber management further reduce the likelihood of adverse effects.

Bicknell's Thrush

Minor effects to Bicknell's thrush could occur through the removal of trees in a known nesting area. Approximately 10 acres of nesting habitat is located within the proposed backcountry ski zones on Deerfield Ridge. This represents about 1.75 percent of the 570 acres of potentially suitable habitat on Deerfield Ridge. However, removal of all 10 acres within these zones is unlikely given the proposal is to create skiable lines 15 to 30 feet wide. Skiable lines would be prioritized within hardwood stands in order to avoid areas of early-successional, high-density balsam fir (Rimmer et al. 2005). Furthermore, ski-area construction or expansion (including off-piste glading) destroying breeding habitat is considered a low-impact threat by the International Bicknell's Thrush Conservation Group (Lloyd and McFarland 2017). Direct effects to individuals would not occur because tree removal for ski trails in areas of Bicknell's Thrush breeding habitat would not occur from April 1 through July 31 (Appendix B, Threatened, Endangered and Sensitive Wildlife Species).

Monarch Butterfly

Adverse effects to monarch habitat are not anticipated. In general, forest thinning and timber harvest projects resulting in increased forb production in the understory are thought to benefit monarchs and other pollinators (USDA 2015). The seeding of log landings and the increased upland openings created and maintained would increase monarch habitat where milkweed and other flowering plants would proliferate.

Rusty blackbird, four-toed salamander, West Virginia white, and southern pygmy clubtail

Given the mitigation measures protecting wetland areas, specific habitat requirements, and project focus on winter timber harvest, it is highly unlikely measurable effects to these four species would result from proposed action implementation.

3.4.4.3 Alternative C: Reduced Roads

Although Alternative C would reduce temporary road construction by 14.3 miles and overall harvest treatments by 683 acres compared to Alternative B, the difference in effects associated with habitat for threatened, endangered and sensitive wildlife species are not discernable.

3.4.5 Cumulative Effects

The cumulative effects analysis area for threatened, endangered, and sensitive wildlife species and their associated habitats includes all lands within the Somerset project area. The cumulative effects analysis considers activities for approximately the past 10 years and 10 years into the future because this is the time frame when changes in overall composition and age class distribution would be detected.

There has been no timber harvesting in the past 10 years in the project area and none beyond the proposed action is expected within the next 10 years. Maintenance of permanent upland openings and apple tree release will occur into the future. This work most often occurs in areas of unsuitable bat habitat and involves removal of small-diameter trees. Construction or maintenance of roads and trails could also alter habitat conditions, particularly the aquatic and riparian habitats. Small amounts of vegetation management have also occurred on state and private lands within the project area. Management is anticipated to continue on these non-National Forest System lands but in minimal amounts.

The cumulative effects to the northern long-eared and sensitive bat species would be minimal given the low amount of past, present and future activities within the project area impacting these species. Likewise, the cumulative effects to other sensitive species would be minimal.

3.5 Threatened, Endangered and Sensitive Plants

Threatened, endangered, and sensitive plant species collectively include species federally listed as threatened or endangered under the Endangered Species Act as well as Regional Forester Sensitive Species. Since there are no plants federally listed as threatened or endangered for the Green Mountain National Forest, there is no discussion of them in this section. Regional Forester Sensitive Species, referred to as "sensitive" species in this section, include plant species identified by the Forest Service for which population viability is a concern.

The biological evaluation prepared for the Somerset project (Deller 2020) is summarized in this section to describe the affected environment and disclose the environmental effects for sensitive plant species.

3.5.1 Issues

Table 3-9 provides the relevant issue (see Chapter 1, Section 1.4), indicator for effects and acceptable effects threshold associated with sensitive plants.

Table 3-9. Issue, indicator and threshold for effects related to sensitive plants

Issue Statement	Indicator	Threshold
Management activities could impact sensitive plant species.	The nature and extent of effects to plants on the Regional Forester Sensitive Species list.	Management activities result in a loss of population viability or trend toward federal listing for any sensitive plant species on the Green Mountain National Forest (Forest Service Manual 2670).

3.5.2 Direct and Indirect Effects Analysis Area

The spatial analysis area for the direct and indirect effects for sensitive plant species is the stands, riverbanks, or travel-ways in or along where activities are proposed, because these locations are where effects would be expected to occur. The temporal extent of the effects analysis is 10 years, because this is the period when proposed treatments would be fully implemented and change to plant habitat would be realized, or in the case of habitat conversion or modification to small sites, it would continue indefinitely.

3.5.3 Affected Environment

Surveys of the project area for sensitive plants were completed during the 2017 and 2018 field seasons. Surveys focused on sites where there were previously documented occurrences or sites most likely to have potential habitat for sensitive plants. Detailed information regarding likelihood of occurrence and specific locations of existing sensitive plant populations or habitat within the project area is provided in the plant biological evaluation (Deller 2019).

There are 22 plants on the Regional Forester Sensitive Species list either known to occur or are not known to occur but have potential habitat within the project area. A summary of these plants include:

- Eight plants known to occur within the project area, but they will not be discussed further because their populations do not overlap with proposed activities and are not close enough to be potentially affected by them
- Five plants known to occur in the project area and overlapping with proposed activities
- Nine plants not known to occur in the project area, but they have potential habitat where project activities are proposed

3.5.4 Direct and Indirect Effects

Direct effects could result from activities such as equipment driving over plants, trees being felled on top of them, prescribed fire burning them, digging them up during planting, or people trampling them. Indirect effects could result from a change in light conditions making the habitat less suitable or a conversion of one habitat type to another (for example, conversion of forest to opening).

3.5.4.1 Alternative A: No Action

No effects would be expected, since no ground or vegetation-disturbing project activities would occur, timber would not be harvested, habitats would not be managed, and habitat suitability would not change. The exception may be species associated with permanent openings where maintenance would not occur. In these areas some populations may decline or be lost due to natural succession from their early successional habitat conditions although maintenance will continue on some sites where the activity has been previously authorized.

Natural processes will create some openings in the canopy within the project area over time. Depending on opening size, location, and other environmental variables in addition to the availability of sensitive plant species' seed at or near the opening, there may be a potential for some sensitive plant species to benefit. Another potential advantage of a naturally created opening where no heavy equipment would be involved, would be less risk of introducing non-native invasive plants that could threaten sensitive plant species habitat. However, it is also possible non-native invasive plant infestations might become worse if they exist where natural disturbances create openings.

3.5.4.2 Alternative B: Proposed Action

Effects are possible for the five sensitive plant species known to occur and overlap with proposed activities and for the nine sensitive plant species with no known occurrence but have potential habitat

where activities are proposed. Although all direct effects for these species are negated by mitigation measures (Appendix B, Sensitive Plant Species), potential indirect effects are provided in Table 3-10.

Table 3-10. Sensitive plant species indirect effects

Species	Indirect Effect
Plants known to occur in the project area and overlapping with proposed activities	
Wiegand's sedge (*Carex wiegandii*)	Ground disturbance and increased light may facilitate non-native invasive plants moving in from infested edges toward the more forested less infested interior. The result may be increased competition for light, water, and nutrients, which could have a negative indirect effect on any of these species. Although mitigation measures would limit the spread of non-native invasive plants (Appendix B, Non-native Invasive Plants), it is unlikely to completely eradicate infestations, is limited in extent by available funds, and is rarely 100 percent effective, even with repeat treatments (see Forest Health, Section 3.2.4.2). Given the focus on non-native invasive plants treatment in the project area, it is hoped the benefits of habitat management would outweigh the risks associated with overlapping and adjacent infestations, but this outcome cannot be guaranteed.
Long-bract green orchis (*Dactylorhiza viridis*)	
American shore-grass (*Littorella Americana*)	
Eastern blue-eyed grass (*Sisyrinchium atlanticum*)	
Northeastern bladderwort (*Utricularia resupinata*)	
Plants not known to occur in the project area, but they have potential habitat where activities are proposed *(the following indirect effects are in addition to the indirect effects provided above)*	
Round-leaved orchis (*Platanthera orbiculata*)	Potential suitable habitat is maintained in any softwood, mixed wood, or hardwood stand where proposed harvest treatments would regenerate these forest types, or possibly in hardwoods where the desired outcome is mixed woods or hardwoods. Potential suitable habitat is lost where forested stands are clearcut to create permanent openings. These orchids' habitat needs are not well understood, and it is not known to what extent the proposed vegetation management would improve and decrease the suitability of the habitat for these species.
Large roundleaf orchid (*Platanthera orbiculata var. macrophylla*)	
Smooth agalinis (*Agalinis paupercula var. paupercula*)	Permanent opening maintenance keeps potentially suitable habitat open.
Leathery grapefern (*Botrychium multifidum*)	
Whorled milkwort (*Polygala verticillata*)	
Pointed blue-eyed grass (*Sisyrinchium angustifolium*)	
Butternut (*Juglans cinerea*)	Increased light caused by vegetation management may increase seedling or sapling survival.
Boreal bedstraw (*Galium kamtschaticum*)	Habitat may remain suitable for bog chickweed which grows in open or shaded habitats, if the vegetation management does not change the microsite hydrology. Habitat may become less suitable for boreal bedstraw, which seems to prefer at least some canopy.
Bog chickweed (*Stellaria alsine*)	

Rare plants not on the Regional Forester Sensitive Species list, but tracked by the state of Vermont, are listed in an appendix to the biological evaluation (Deller 2019) along with their location relative to proposed activities. Of the 25 rare plants in this category, four are present and known to overlap proposed

activities: Hayden's sedge (*Carex haydenii*), fall dropseed muhly (*Muhlenbergia uniflora*), small-flowered rush (*Luzula parviflora*), and water bur-reed (*Sparganium fluctuans*). One, northern adder's-tongue (*Ophioglossum pusillum*) is historical at Grout Pond and has been searched for repeatedly and not found. Although direct and indirect effects are possible, these species have been previously evaluated as possible addition to the Regional Forester Sensitive Species list and were determined to not be at risk of loss of viability on the Green Mountain National Forest.

3.5.4.3 Alternative C: Reduced Roads

Although Alternative C consists of 14.3 fewer miles of temporary road construction and 683 fewer acres of timber harvest treatments compared to Alternative B, there would be no difference in effects associated with the known occurrence of sensitive species or their habitat.

3.5.5 Cumulative Effects

The spatial extent of the cumulative effects area is the entire Green Mountain National Forest, because the Forest Service is required to prevent loss of viability for species in this context (Forest Service Manual 2670). The temporal extent of the cumulative effects is the length of the planning period, because species viability evaluations were completed during the 2006 Forest Plan revision, are reevaluated whenever the Regional Forester Sensitive Species list is updated, and would be completed again the next time the Forest Plan is revised (typically no longer than 20 years from the previous evaluation).

The kinds of past activities affecting these species in the cumulative effects analysis area are the same kinds proposed with the Somerset project. They include the proposed vegetation management and ground disturbance activities within areas of known species occurrence. For all of the sensitive species discussed, no past projects have been implemented where they are known to occur, or if projects occurred near them, the plants were protected through mitigation measures or project design criteria. At this time, the only other present or foreseeable future project planned for locations where these species are known to occur is the Early Successional Habitat Creation Project scattered throughout the Manchester Ranger District for which design criteria are in place to minimize impact to these species. In addition, some projects have occurred, and may occur in the future, where there is potential habitat for plants on the Regional Forester Sensitive Species list. In general, although some habitat types have been or will be converted through forest management activities (for example, a forest harvested to create a permanent opening), others have been or will be enhanced and maintained. Overall, there is no known trend of loss of potential rare plant habitat for plants on the Regional Forester Sensitive Species list. In addition, no known occurrences are documented to overlap with timber harvests on non-National Forest System land.

For round-leaved orchis, which is declining in Vermont and has not been relocated in recent years at some Green Mountain National Forest sites, viability is a concern, but no trend toward federal listing is expected, given the species is not rare enough to have a national rank, is distributed throughout the northern United States and Canada, including all of New England, and is globally secure. Six new small populations of round-leaved orchis (some *Platanthera orbiculata*, some *P. orbiculata var. macrophylla*) were located in 2019 during inventory for the Early Successional Habitat Creation Project. Although this suggests this species complex is not declining in Vermont, orchids are known to disappear underground for a few years at a time, presumably until mycorrhizal conditions are suitable for above-ground growth. This occasional disappearance makes trends difficult to assess.

Additional factors possibly affecting plants on the Regional Forester Sensitive Species list associated with their habitats are environmental climate change stressors. Climate change research (summarized in part by Mattrick 2009) suggests while there is no doubt climate is changing and habitats and species may be affected by this change, the nature of the change is uncertain, is likely to vary greatly by species and geographic area, and is not likely to contribute cumulatively to a change in Regional Forester Sensitive

Species populations in these types of habitats within the analysis timeframe, because plant community changes occur relatively slowly. Of the sensitive plant species either known to occur or with potential occurrence within areas affected by proposed activities, all but two are in the middle of their range in Vermont, and so there is opportunity, geographically, for migration of their populations over a long period of time. For the two species occurring closer to the southern edge of their range in the United States, there is still opportunity for them to migrate northward or upward in elevation in Vermont.

In summary, given mitigation measures are expected to be effective (Appendix B, Sensitive Plant Species), the Somerset project and all relevant past, present or future actions possibly causing effects to Green Mountain National Forest sensitive species would not be expected to lead to loss of viability or a trend toward federal listing for any plant on the Regional Forester Sensitive Species list. The threshold for the effects would not be reached.

3.6 Aquatics

This section includes the disclosure of effects related to the fishery and water resources.

3.6.1 Issues

Table 3-11 provides the relative issues (see Chapter 1, Section 1.4), indicators for effects and acceptable effects thresholds associated with aquatic resources.

Table 3-11. Issues, indicators and thresholds for aquatic resources effects

Issue Statement	Indicator	Threshold
Proposed road construction and use could impact water quality.	Road density (miles of road per square mile of watershed). Road proximity to streams (percent of roads within 300 feet of streams). Percent of roads where Best Management Practices for Water Quality (USDA Forest Service 2012b) to maintain and design roads are followed. Potential for mass wasting	Watershed Condition Classification for Road and Trail Condition Indicator attributes (Road Density, Proximity to Stream, and Best Management Practices Application) change from good (functioning properly) to fair (functioning at risk); or fair to poor (impaired function). (USDA Forest Service 2011)
Management activities could affect the water quality in streams including those classified as A(1) per the Vermont Department of Environmental Conservation Guidelines.	State water quality standards for Class A(1) surface waters.	Effects from management activities result in not meeting Vermont Water Quality Standards (VANR 2017).
Land clearing and creation of a permanent upland opening at the intersection of Forest Road 71 and Somerset Road (Compartment 102/Stand 10) could destabilize the temperature of the Deerfield River.	Application of Forest Plan standards and guidelines that protect stream temperatures.	Maintaining at least a 70 percent canopy closure of streams with objective of an average daily water temperature less than 72 degrees Fahrenheit is not met (Forest Plan, page 22).

3.6.2 Direct and Indirect Effects Analysis Area

The analysis area for the direct and indirect effects for aquatic resources consists of the areas in rivers, streams, and riparian zones where water quality and fish habitat would be disturbed by forest management, recreation, or fish habitat restoration activities. Specifically, this would include all stands proposed for commercial vegetation management and associated haul roads, skid trails and landings along

streams, and trail and road construction and decommissioning activities in close proximity to streams or within riparian areas. The timeframe for the effects analysis is 10 years which is the approximate number of years expected to implement all proposed project activities.

3.6.3 Affected Environment

The project area is drained by portions of the following 6th level watersheds:

1. Headwaters Deerfield
2. East Branch Deerfield
3. North Branch Deerfield
4. Wardsboro Brook
5. Sherman Dam-Deerfield
6. Warm Brook

The East Branch is impounded by the Somerset dam creating the 1,568-acre Somerset Reservoir. Below the confluence with the East Branch, the Deerfield River is impounded by the Searsburg dam creating the 25-acre Searsburg Reservoir. The project area also includes Grout Pond (84 acres) and Haystack Pond (29 acres) which are natural lakes.

Fish Population

Fish communities are dominated by native brook trout in headwater streams with occurrences of brown trout at lower elevations. Portions of the primary river systems in each watershed are stocked annually with brook trout and limited amounts of brown and rainbow trout to support a recreational fishery. Non-game species include long-nose dace, blacknose dace, creek chub, common shiner, and brown bullhead.

Monitoring of brook trout populations provides a method to assess overall headwater stream ecosystem integrity. The resulting status of populations will ultimately demonstrate the severity of all habitat stressors collectively. Trout sampling in 1990 and 2017 below Somerset Reservoir at two sites on the East Branch showed trout populations were low. Sampling in headwater streams also indicate trout numbers are low compared to other areas on the Green Mountain National Forest.

Large Wood and Pool Habitat

Stream habitat surveys show all stream reaches evaluated lack large wood material and pool habitat. Large wood is a critical component of stream habitat providing processes and functions important to aquatic organisms, floodplain connectivity, sediment storage, and stream channel stability. Existing streams have large wood in their channels ranging from 4 to 35 pieces per mile providing low habitat diversity and limited cover for fish and aquatic organisms. Research data and scientific literature indicate under natural conditions riparian forest in New England are capable of sustaining and providing organic matter and large wood to stream channels totaling about 175 to 230 pieces per mile (Forest Plan, page 14).

Stream Temperature

Stream temperatures are a critical habitat parameter for brook trout. Temperatures in the 52 to 60.8 degrees Fahrenheit (F) range are considered optimum for trout growth while temperatures in excess of 72 degrees F cause heat stress. Castle Brook, Rake Branch, and the Deerfield River exhibit heat stress as indicated by the frequency and duration when temperatures reached or exceeded 72 degrees. Riparian areas along these tributaries are forested and provide shade; however, these watersheds have extensive wetlands and beaver flowages increasing temperatures in a natural process.

Water Quality

Surface waters in Vermont are classified by the governing water quality law implemented through State rules and guided by Vermont Agency of Natural Resources policy pursuant to the Water Pollution Control Act of 1972 (Clean Water Act, or Act). Pursuant to the Act, States are required to establish and implement water pollution control programs. In particular, delegated states like Vermont must classify surface waters, designate specific uses to each classification those surface waters are managed to support, and adopt specific water quality criteria designed to protect the designated uses at the established classification level (VANR 2017).

Class A(1) surface waters in the project area include: all streams above 2,500 feet in elevation, all streams in the Glastenbury Wilderness Area, Deerfield River Headwaters and tributaries upstream of Rake Branch, Cold Brook from its headwaters to its confluence with Mountain Brook, and Haystack Pond.

Three river sections are listed as impaired within the project area. The East Branch from Somerset Dam downstream for 5.2 miles and the mainstem Deerfield for 3.6 miles downstream of Searsburg dam are critically acidified from acid deposition.

The Water Condition Classification Technical Guide (USDA Forest Service 2011) was used to evaluate the overall condition and health of watersheds within the project area based on 12 indicators with 24 attributes. All watersheds are rated "Good" (functioning properly) with the exception of the East Branch which rates "Fair" (functioning at risk) due to the impoundment created by Somerset dam.

Climate Change Adaptation

Current and future hydrologic variability is a major driver underlying large-scale management and modification of inland waters and river systems on National Forest System lands. Watershed conditions including the timing, quality and quantity of peak and base flows will likely be affected by a changing climate. Extreme precipitation events have increased significantly in the Northeast in the past two decades (Haung et. al. 2017). More precipitation will occur in winter and less in summer. Rising air temperatures may make marginal cold-water stream habitats inhospitable pushing aquatic communities into refugia.

3.6.4 Direct and Indirect Effects

Table 3-12 provides the criteria specific to four "Road and Trail Condition Indicator" attributes from the Water Condition Classification rating system: road density, percent of roads near streams (300 feet), application of best management practices, and potential for mass wasting. These attribute rating components are used to assess water quality effects from roads and snowmobile trails within the project area.

Table 3-12. Attribute ratings for the road and trail condition indicator (USDA Forest Service 2011)

Attribute	Functioning Properly[1] (Good)	Functioning at Risk[2] (Fair)	Impaired Function[3] (Poor)
Open Road Density	Less than 1 mile of road per square mile of watershed.	1 to 2.4 miles of road per square mile of watershed.	More than 2.4 miles of road per square mile of watershed.
Proximity to Water	Less than or equal to 10 percent of road/trail length are within 300 feet of streams or hydrologically connected.	10 to 25 percent of road/trail length are within 300 feet of streams or hydrologically connected.	More than 25 percent of road/trail length are within 300 feet of streams or hydrologically connected.
Best Management Practices (BMP's) Applied	Road and trail drainage BMP's are applied more than 75 percent of the time.	Road and trail drainage BMP's are applied 50 to 75 percent of the time.	Road and trail drainage BMP's are applied less than 50 percent of the time.
Mass Wasting	No danger of mass failure.	Some danger, not a primary	Primary concern.

Attribute	Functioning Properly[1] (Good)	Functioning at Risk[2] (Fair)	Impaired Function[3] (Poor)
		concern.	

[1] Density of roads and linear features indicate hydrologic regime is substantially intact
[2] Density of roads and linear features indicate moderate probability hydrologic regime is substantially altered
[3] Density of roads and linear features indicate high probability hydrologic regime is substantially altered

3.6.4.1 Alternative A: No Action

There would be no direct or indirect effects on the fishery or water resources in the project area including no disturbance to the stream channel, no change or loss of fish habitat and riparian vegetation, no risk to other aquatic resources, and no additional degradation of water quality. There would continue to be a barrier to aquatic organism along Castle Meadows Trail where a culvert replacement is proposed, and stream habitat would remain below its productive potential because the proposed habitat restoration activities including placement of large wood would not take place.

Some watershed functions, processes and habitat conditions would recover over time and others would not. Modeling of large wood recruitment into New England stream channels indicates an anticipated full loading of 175 to 230 pieces per mile of stream and suggests unharvested hardwood riparian forests would be 150 to 200 years old before these wood loadings are approached (Nislow 2010). Functions of instream large wood would slowly recover over the next several decades including stream stability, floodplain connectivity, nutrient and sediment retention, flood attenuation, and fish and aquatic invertebrate habitat.

The processes of water infiltration and storage, subsurface flow and minimum drainage networks all function to increase groundwater, attenuate peak flows, sustain base flows and reduce sediment mobilization and downstream flooding. Short-term impacts to these functions from road and trail construction and use would be avoided. The opportunity to rehabilitate the many miles of legacy roads from past management would be missed and the interception of subsurface flow, increased drainage network and erosion from those roads would not recover.

Identifying and implementing management actions that mitigate anticipated flow extremes is a critical component of climate adaptation strategies and are particularly essential to address extreme flows (floods and droughts) that have ecological, social, and economic importance. These watershed-scale climate change adaptations that increase transient and long-term water storage would not be implemented to the detriment of aquatic and riparian ecosystem and downstream human communities.

3.6.4.2 Alternative B: Proposed Action

Water Quality – Temporary Road Construction and Use

Proposed temporary road construction and use would result in the potential to mobilize sediment from the road prism to streams and intercept subsurface flow resulting in potential adverse effects for fish habitat and water quality. Subsurface flows intercepted by road compaction and cut slopes can increase stream discharge if allowed to enter the stream network. This occurs when road ditches and cross drains enter directly into intermittent, ephemeral or perennial streams. Movement of subsurface flow into surface flow increases peak discharges in streams and decreases base flows sustained by slow groundwater discharge. The extent to which a road network directly adds to the stream drainage network and alters hydrology depends on road drainage system efficacy to move water off the road and infiltrate back into the soil before reaching the stream network.

The water quality effects from the proposed construction and use of roads can be ascertained from the combination of road density, proximity to streams, the application of best management practices for maintenance, and potential for mass wasting. These indicator attributes were applied to five watersheds within the project area including National Forest System and private lands to determine their Road and Trail Condition attribute ratings under each alternative. Warm Brook was not evaluated because of the small area and no management activities were planned in that watershed.

Table 3-13 shows the road density and percent of road network within 300 feet of streams for project area watersheds and their corresponding Water Condition Classification attribute rating under the no action and action alternatives. Snowmobile trails are included in the attribute rating process for this analysis.

Table 3-13. Change in the road density and proximity to streams attribute ratings under Alternatives A, B and C for each watershed within the Somerset project area

Watershed	Alternative A (existing)[1]		Alternatives B and C[2]	
	Attribute		Attribute	
	Road density[3] (Rating[4])	Percent roads within 300 feet of streams (Rating[4])	Road density[3] (Rating[4])	Percent roads within 300 feet of streams (Rating[4])
Deerfield River Headwaters *(47.7 square miles)*	1.48 (Fair)	40 (Poor)	1.33 (Fair)	37.5 (Poor)
East Branch Deerfield *(29.2 square miles)*	0.77 (Good)	36 (Poor)	0.69 (Good)	39 (Poor)
North Branch Deerfield *(23.1 square miles)*	3.0 (Poor)	36 (Poor)	3.0 (Poor)	35 (Poor)
Wardsboro Brook *(6.0 square miles)*	1.89 (Fair)	37 (Poor)	1.89 (Fair)	37 (Poor)
Sherman Dam - Deerfield *(5.1 square miles)*	1.81 (Fair)	35 (Poor)	1.81 (Fair)	35 (Poor)

[1] Alternative A (No Action) = All existing National Forest System roads + town roads + state roads + snowmobile trails.

[2] Alternatives B and C (Proposed Action and Reduced Roads) = Same as No Action minus proposed system road and snowmobile trail decommissioning. Proposed temporary roads are not included because they would be closed following their use for timber harvest activities.

[3] Road Density is miles of road per square mile of watershed.

[4] From the Water Condition Classification Technical Guide (USDA Forest Service 2010) (see Table 3-12).

Road density and percent of roads in proximity to streams would decrease or remain the same for all watersheds, thus there would be no change to the water condition classification rating for these attributes. Proposed temporary roads are not included in the attribute ratings because they would be closed after their use for timber harvest access following standard timber sale contract provisions and project specific mitigation measures (Appendix B, Soil and Wetlands). Additionally, 3.83 miles of existing system roads and 4.1 miles of snowmobile trails would be decommissioned further improving water quality conditions. The only exception would be for the East Branch Deerfield where the percent of roads within close proximity of streams would increase three percent. This increase, however, is the result of a reduction in overall road miles within the watershed after permanent system roads are decommissioned, but the same number of miles within 300 feet of streams would remain.

The rating associated with best management practices and mass wasting attributes would not change from implementation of proposed temporary road construction and use. While best management practices specific to water quality (USDA Forest Service 2012b) were not expressly evaluated for the proposed action, monitoring for compliance with Forest Plan standard and guidelines and Vermont Acceptable Management Practices (VANR 2018; VANR 2019a) associated with timber harvest activities including

temporary road construction show aquatic resources have not been adversely affected (USDA Forest Service 2000, 2004, 2007, 2009a, 2010 and 2011). Likewise, the potential for mass wasting is generally very low on the Green Mountain National Forest and extremely low based on soils and landforms within the project area (personal communication, Brian Austin and Angie Quintana). Existing and temporary roads would therefore have little to no effect on aquatic resources associated with mass wasting.

In summary, road densities would be reduced or remain the same in the five watersheds where management actions are occurring. Overall, the effects from temporary road construction and use on stream habitat and water quality resources would be minor because Forest Plan standards and guidelines (Forest Plan, Section 2.3.2 Soil, Water, and Riparian Area Protection and Restoration, pages 20 to 22), Vermont Acceptable Management Practices (VANR 2018; VANR 2019a), National Best Management Practices for Water Quality (USDA Forest Service 2012b), and project specific mitigation measures (Appendix B, Soil and Wetlands) would be effective in avoiding or minimizing effects.

Water Quality – Class A(1) Streams

Proposed harvest activities including temporary road construction and use would meet Vermont Water Quality Standards including those required for streams classified as A(1) per the Vermont Department of Environmental Conservation Guidelines. In addition, restoration of large wood throughout the watershed would restore watershed functions such as nutrient and sediment storage, floodplain connection, and channel stability.

Past monitoring of projects has included the review of stream channel stability, sedimentation, turbidity, temperatures, aquatic insect viability, and fish populations. This monitoring indicates forest management activities are not violating Vermont Water Quality Standards or negatively impacting aquatic resources in other ways (USDA Forest Service 2000, 2004, 2007, 2009a, 2010 and 2011). It follows that as long as all harvesting carried out on National Forest System lands is compliant with protective measures required by Forest Plan standards and guidelines and Vermont Acceptable Management Practices (VANR 2018; VANR 2019a), the activity is presumed compliant with the Water Quality Standards. In addition, the Vermont Agency of Natural Resources has worked with Forest Service staff to empirically document the effectiveness of forest management practices implemented on National Forest System lands (VANR 2016, VANR 2017).

Stream Temperature

Brook trout are the most temperature sensitive trout of the three species found in the project area. At temperatures above 72 degrees F they become stressed (VFWD 2018). Because stream temperatures in most Vermont streams rise and fall with air temperatures, stream shading is critical to maintain suitable habitat during the warmest periods of the summer (July to August).

The proposed land clearing to create upland openings in Compartment 102, Stands 10 and 11a is located along Forest Road 71 adjacent to the Upper Deerfield River. Although riparian buffers would be protected along all streams within the project area through project design and best management practices, the Deerfield River adjacent to the proposed openings benefit less from shade because of its width. This makes smaller cool tributaries feeding into the river critical.

The application of the Forest Plan guideline to maintain greater than 70 percent shade along the Deerfield River headwaters of Deer Lick Brook, Deer Cabin Brook and the Glastenbury River would keep the main stem of the river suitably cold for brook trout (Forest Plan, Section 2.3.2, Guideline G-13, page 22). In addition, the application of the guideline application to maintain a 25-foot no cutting zone within all perennial stream buffers including the Deerfield River would help maintain temperatures at desired levels (Forest Plan, Section 2.3.2, Guideline G-1, page 21).

Climate Change Adaptation

Watershed restoration actions including instream large wood additions and rehabilitation of existing non-system roads would have a positive effect on climate change resilience. Reconnection of floodplains would store and slow flow while improving aquatic and riparian habitat and increasing refugia during extreme low, high and warm stream conditions. Disconnecting non-system road runoff from the stream networks would keep sediment from streams and allow intercepted subsurface flow to re-infiltrate.

Reconstruction, construction and use of existing temporary roads pose an increased risk with the rise of extreme rain events. Adherence to Vermont Acceptable Management Practices for temporary road construction and maintenance and Somerset project mitigation measures (Appendix B, Soil and Wetlands) would control erosion so that sediment does not enter the stream drainage network. Additionally, the decommissioning of 2.5 miles of system roads and a net decrease of 2.8 miles of snowmobile trail would reduce the permanent transportation footprint within the project area which would have a minor but long-term positive effect associated with watershed conditions.

3.6.4.3 Alternative C: Reduced Roads

Alternative C consists of 14.3 fewer miles of temporary road, and 683 fewer acres of timber harvest, or seven percent reduction compared to Alternative B. These decreased amounts of temporary road construction and use and harvest treatment acres would reduce the potential for minor short-term effects associated water quality from sedimentation and overall hydrological watershed functions within the project area. Although the use of the majority of existing non-system road or trail templates would still be used for skidding of timber to landings, the overall effects would be less than using them as temporary road locations.

The Water Condition Classification attribute ratings would be the same as those disclosed for Alternative B (see Table 3-13). Temporary roads are not included for determining the attribute ratings because of their short-term use and subsequent closure following timber harvest activities.

3.6.5 Cumulative Effects

The cumulative effects analysis area associated with aquatic resources includes all lands within the Deerfield Headwaters, East Branch Deerfield, North Branch Deerfield, and Wardsboro Brook watersheds. The timeframe for the cumulative effects analysis is 10 years in the past and future. This timeframe was chosen because it is a reasonable length of time for measuring past effects and for predicting the effects for reasonably foreseeable projects.

The cumulative effects of activities in the analysis area resulting in, or potentially resulting in, additional stream habitat and water quality effects are timber harvesting, non-native invasive plant control, road/trail construction and maintenance, agriculture, development and other ground disturbing activities and encroachment into riparian areas. These activities can increase sedimentation and reduce riparian vegetation where travel corridors parallel or cross streams.

There have been no harvest activities on National Forest System lands within the analysis area within the past 10 years. Additional timber harvest is planned associated with the Early Successional Habitat Creation Project over the next 10 years within the East Branch (382 acres), Wardsboro Brook (1,699 acres and North Branch Deerfield River (1,272 acre) watersheds. Temporary and Operation Maintenance Level (OML) 1 permanent system road construction have the potential for additional effects for aquatic habitat. Existing town and Forest Service system roads combined with existing non-system roads are adequate to access the harvest locations. No new OML 1 permanent system roads would be constructed, but a portion of two non-system roads (from previous International Paper ownership) may be designated as system roads. Temporary roads or skid trails would have potential to add to the cumulative effects for water

quality but would be minor and of short duration occurring over 15 years with the application of Forest Plan standards and guidelines including Vermont Acceptable Management Practices and project specific design criteria or mitigation measures. Watershed Condition attributes of road density would not change and there would be no increase in percent of roads within 300 feet of streams.

There have been minimal amounts of timber harvesting on state and private lands, and this is assumed to be the case into the foreseeable future. Specific existing and future agricultural activities and general development on private land is not known but is assumed to be relatively low given the remoteness of most of the project area. It is reasonable to assume sediment and runoff from ground disturbing activities including timber harvest, roads, and trails have entered streams over the past several decades. Habitat surveys in project area streams however, indicate current sedimentation levels are relatively low and are not adversely affecting stream bottom habitat and fish populations (USDA Forest Service 2018a). It is assumed harvesting activities on state and private land would follow Vermont Acceptable Management Practices (VANR 2018; VANR 2019a) to protect water quality. Therefore, the cumulative effects from past, present and future activities would have a minimal effect associated with aquatic resources within the analysis area.

3.7 Soil and Wetlands

3.7.1 Issues

Table 3-14 provides the relative issues (see Chapter 1, Section 1.4), indicators for effects and acceptable effects thresholds associated with the soil and wetlands resources.

Table 3-14. Issues, indicators and thresholds for soil and wetlands resource effects

<table>
<tr><th>Issue Statement</th><th colspan="2">Indicator</th><th>Threshold</th></tr>
<tr><td>Timber harvesting activities including landing, skid road, and skid trail construction and use could compact soils, increase erosion, reduce soil productivity and damage wetland functions.</td><td colspan="3">The Somerset project soil quality standards (Quintana 2020) provide the following indicators and maximum amount of area of harvest treatment units affected (threshold) where soil property changes from harvest activities retain a low risk of negatively affecting ecosystem components, functions, or services:
<table>
<tr><th>Soil property change indicator</th><th>Threshold – percent of harvest treatment area</th></tr>
<tr><td>Mineral soil exposed</td><td>5</td></tr>
<tr><td>Topsoil displacement</td><td>10</td></tr>
<tr><td>Erosion (sheet, rill, gully)</td><td>5</td></tr>
<tr><td>Rutting or puddling greater than 10 centimeters deep</td><td>5</td></tr>
<tr><td>Compaction 10 to 30 centimeters deep</td><td>10</td></tr>
<tr><td>Mixing of soil surface layers</td><td>10</td></tr>
<tr><td>Overall Detrimental Disturbance[1]</td><td>10</td></tr>
<tr><td></td><td>Threshold - other parameters</td></tr>
<tr><td>Litter layer loss</td><td>1 inch</td></tr>
<tr><td>Leaching</td><td>Bole-only removal, except in permanent wildlife openings</td></tr>
</table>
[1] Overall detrimental disturbance is the amount of soil affected within a harvest area potentially impairing long-term soil productivity or hydrologic function. The presence of detrimental disturbance is ascertained from measurement of soil property change indicators at survey points within harvest units using the Forest Soil Disturbance Monitoring Protocol (USDA Forest Service 2009b).</td></tr>
</table>

Issue Statement	Indicator	Threshold
Temporary road construction and use could compact soils, increase erosion, reduce soil productivity and damage wetland functions.	Miles and acres of proposed temporary road construction provides the amount of disturbance resulting in reduced soil productivity. These areas are not expected to support productive forest regeneration over the next 20-30 years. Percent of harvest impact area affected by proposed temporary road construction. The harvest impact area is defined as the total acres of stands proposed for harvest plus temporary roads needed for access. Miles and acres of proposed temporary road construction with sensitive soil attributes such as shallow, very poorly drained or poorly drained soils; or having a severe erosion hazard rating or steep slopes; or crossing near or within a wetland. Percent of harvest impact area affected by temporary road construction with sensitive soil attributes. A greater percentage of the harvest impact area covered with roads with sensitive soils represents higher risk for more intense detrimental soil disturbance.	Temporary road construction and use results in unacceptable levels of soil and wetland resource degradation.
Land clearing and creating a permanent upland opening at the intersection of Forest Road 71 and Somerset Road (Compartment 102/Stand 10) could increase erosion.	Amount of soil disturbed from land clearing including removal of root wads.	Land clearing and removal of root wads results in sedimentation of the Deerfield River to levels adversely affecting water quality and other attributes of aquatic habitat.
Prescribed fire including the construction of fire lines could damage soil quality and wetland functions.	Amount of prescribed fire. Amount of fire line constructed.	Prescribed fire and fire line construction results in unacceptable levels of soil and wetland resource degradation.

3.7.2 Direct and Indirect Effects Analysis Area

The soil and wetlands resource effects analysis area consist of those areas where these resources could be disturbed, as a result of proposed management activities. For this analysis, disturbance consists of where soils are excavated, moved, mixed, or compacted, or organic matter is lost or burned. The timeframe for the effects analysis is 40 years beyond implementation. This includes 10 years to account for the approximate time expected to implement all proposed project activities with an additional 30 years for soil productivity to recover on non-system roads used for proposed temporary roads.

3.7.3 Affected Environment

Table 3-15 provides the amount of system and non-system roads within or in close proximity to proposed timber harvest areas (harvest impact area[8]). There are 31.2 miles of existing system roads in the harvest impact area with an average width of 22 feet including ditches. Approximately 53 miles of existing non-

[8] The harvest impact area (9,628 acres) is the proposed harvest treatment acres plus acres covered by temporary roads for Alternative B (9,544 acres + 84.5 acres). See Table 3-18.

system roads and trails are located in the harvest impact area with an average width of 14 feet including ditches. The non-system roads or trail corridors have reduced soil productivity mainly due to compaction from past use. There is also ongoing erosion and sedimentation on some non-system roads and trails throughout the project area, including areas where they have turned into streams.

All system and non-system roads within the harvest impact area occupy approximately 173.1 acres, or 1.79 percent of the total harvest impact area acres. This area will have reduced long-term soil productivity.

Table 3-15. Existing permanent and non-system roads within the harvest impact area

	Length (miles)	Acres of Disturbance	Roads in harvest impact area (percent)
Existing permanent (system) roads	31.2	83.2	0.86
Existing non-system roads	53.0	89.9	0.93
Total	**84.2**	**173.1**	**1.79**

Table 3-16 provides the number of acres where harvest is proposed within areas having sensitive soil attributes, and their percent of the total proposed harvest acres within the project area (9,544 acres in Alternative B and 8,861 acres in Alternative C[9]). These attributes increase the risk of soil property changes from harvest activities at levels resulting in detrimental soil disturbance (see Table 3-14).

Approximately 7.6 percent of the soils in the proposed timber harvest stands in Alternative B and Alternative C are rated as having severe soil erosion hazard by the Natural Resources Conservation Service (NRCS 2019). Erosion hazard ratings indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities expose the soil surface. A severe erosion hazard indicates erosion is very likely and soil conservation measures such as winter logging, skid trails constructed across the slope, and water bars are essential to keep erosion at acceptable levels (VANR 2018; VANR 2019a). The soils with severe erosion hazard also have a harvest equipment operability rating of poorly suited. There are 723 acres and 681 acres in Alternatives B and C, respectively where soils with proposed timber treatments are rated poorly suited, indicating that overcoming the unfavorable soil properties requires special design, maintenance, or alteration during timber harvest operations.

Soils in Compartment 102/Stand 10 where land clearing to create a permanent upland opening is proposed are dominantly mapped as spodosols. These soils are rare in the United States, but common in Vermont. They were formed over thousands of years as hemlock, spruce and fir began growing after glaciation revealing the underlying bedrock.

Wetlands[10] are abundant in the project area and are generally in good to excellent condition. There are approximately 5,670 acres of wetlands or eight percent of the total project area acres. The Vermont Significant Wetland Maps indicates 461 wetlands over one-half acre in size mapped within the project area (VANR 2019b). Many are located adjacent to planned harvest activities. However, those maps have been recently shown to miss approximately 82 percent of wetlands less than three acres in size, and 68 percent of wetlands 3 to 20 acres in size, so the actual number of wetlands in the project area is likely substantially higher (Sweeney and Morrissey 2006). The majority of the wetlands occur in low sloping,

[9] Includes harvesting to create permanent upland openings.

[10] The U.S. Army Corps of Engineers defines wetlands as areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (US EPA 2020).

concave landscape positions. Existing wetland conditions are fully vegetated and maintain their important functions and values such as providing food and habitat for wildlife, water storage and infiltration, flood protection, and nutrient filtering to improve water quality.

Climate change stressors anticipated for soil and wetland resources over the next 80 years include warmer summer and winter temperatures, decreased snow cover each month, and increases in the intensity and amount of precipitation and frequency of catastrophic storm events (Rustad et al. 2012.) Altogether, these stressors can increase risks of habitat degradation related to soil organic carbon losses, soil disturbance related to timber harvesting, erosion caused by flooding, soil nutrient losses related to increased leaching, and wetland habitat loss and degradation. Additionally, changes in evapotranspiration and soil respiration could substantially alter water and nutrient cycling and surface water temperatures (Rustad et al. 2012).

Soil organic carbon is the largest terrestrial carbon sink and managing this pool is critical to mitigating increasing carbon dioxide in the atmosphere. Soil respiration releases carbon dioxide from the soil, with rates strongly influenced by temperature. Increasing temperatures accelerated by climate change increase the release of carbon from the soil. Even a small increase in soil respiration could exceed the amount of carbon released each year by land use change and fossil fuel combustion combined. This could generate substantial feedbacks to climate change (Rustad et al. 2012).

Wetland soils contain much more carbon than upland soils, putting them at higher risk carbon loss to the atmosphere with warmer annual temperatures. Disturbing the forest floor or topsoil exposes soil organic carbon to air and makes it vulnerable to increased soil microbe metabolism leading to the release of carbon into the atmosphere. This can produce a feedback loop for many soils with wetland soils having the strongest input. At the same time, wetlands provide an effective strategy for mitigating and adapting to the impacts of climate change.

Past and current acid deposition has negatively affected soils in the project area. Acid deposition depletes important nutrient pools and degrades soil productivity (Caputo et al. 2016). Incoming atmospheric sulfur and nitrogen deposition has likely caused soils in the higher elevations of the project area to become more acidic. In addition, important nutrients such as calcium and magnesium are likely being leached from the soils. This can impair soil and ecosystem long-term productivity. Forested areas have been mapped showing “critical loads” for nitrogen and sulfur deposition, for surface water acidity, forest ecosystem acidity, and eutrophication and other empirical critical loads (NADP 2015). The critical load for a forest ecosystem is the level of sulfur plus nitrogen deposition, above which significant harmful ecological effects, including to soil fertility, forest health, and forest productivity, is estimated to occur. All of the project area is mapped as having deposition above critical loads.

3.7.4 Direct and Indirect Effects

3.7.4.1 Alternative A: No Action

There would be an overall positive affect on soil and wetland resources except where current erosional processes are ongoing or worsening. Without soil disturbing activities or restoration activities, ongoing soil processes degrading or improving soil and wetland resources would likely continue at similar rates to those currently occurring. Soils would not be subject to the risks of erosion, compaction, and impaired nutrient cycling inherent with activities such as tree harvesting, upland opening creation, root wad removal, or construction of roads, parking lots, and trails. Valuable soil functions would be enhanced, including water purification, water storage, flood mitigation, nutrient cycling, supporting biodiversity, and carbon storage.

At the same time, opportunities to improve soil conditions as described in the proposed action would be forgone. This includes erosion control and associated restoration activities on roads, old skid trails, recreation trails, and road and trail closures. Existing areas of bare soil in the project area, including on non-system roads and trails, would continue to erode at varying rates. The erosion and surface flow over these soils would continue contributing to steam sediment loading.

3.7.4.2 Alternative B: Proposed Action

Proposed soil restoration activities, including trail and road decommissioning and stabilization, stream habitat restoration, and non-system woods road erosion control projects would substantially reduce risks of erosion and sedimentation in the project area while improving the natural ecological functions of the soil. The stabilization of soil conditions proposed for 10.8 miles of existing non-system roads would check or reverse ongoing negative soil effects where existing non-system roads and trails intercept groundwater or cause surface runoff to concentrate with increasing velocity causing more potential for flash flooding and erosion. These benefits to soil and wetland resources mitigate climate change stressors including anticipated increases in the intensity and amount of precipitation and frequency of catastrophic storm events in the Northeastern United States.

Proposed timber harvest, upland opening creation including root wad removal, road/trail construction and use, and parking lot construction could negatively affect soil and wetland resources. Application of relevant Forest Plan standards and guidelines, Vermont Acceptable Management Practices (VANR 2018; VANR 2019a), National Best Management Practices for Water Quality (USDA Forest Service 2012b), and project specific mitigation measures (Appendix B, Soil and Wetlands) reduce the risks of those negative impacts to acceptable levels.

Timber Harvest Activities

The proposed action includes the construction and use of landings, skid roads and skid trails to remove harvested trees from the treatment areas throughout the project area. Landing needs were based on limiting skidding distances to approximately 2,500 feet. Landings typically between one-quarter and one-half acre would be constructed and used to process harvested trees and load them onto trucks. Two existing landings from prior vegetation management operations may be suitable for re-use, requiring approximately 134 landings to be newly constructed. The landings would affect up to 67 acres or 0.7 percent of the total proposed harvest area. Ground-based logging systems would be used for felling and skidding of trees. Skidders may use grapples or cables. Skid roads and trails would be needed throughout harvest treatment areas to transport trees to landing sites. Skid roads/trails are generally 10 to 12 feet wide.

The construction and use of landings, skid roads and skid trails could result in detrimental soil disturbance due to high risks of compaction, rutting, erosion, and/or loss in soil productivity, and sediment deposition into waterbodies. Recovery from compaction is slower where compaction is more severe. For these types of activities, compaction would be greatest at log landings and along primary skid roads where equipment passes over the soil repeatedly. The extent of detrimental soil disturbance has been found to be substantially higher from summer than winter harvest (Reeves et al. 2011). For stands with summer logging or sensitive soil attributes (such as poorly drained, shallow or high elevation soils), the potential for detrimental disturbance from timber harvest activities is higher.

Table 3-16 provides the acres of steep slopes and shallow, poorly drained, and high-elevation soils, or soils with severe erosion hazard rating and poorly suited for harvest equipment operability for both action alternatives. Soils with these sensitive soil attributes in Alternative B cover approximately 1,690 acres or 17.8 percent of the proposed timber treatment area acres. Soils with these attributes are more sensitive to

long-term soil productivity reduction compared to soils without these attributes under the same management activities. For example, shallow soils and steep slopes can lose soil faster than it can be regenerated, and shallow soils and high-elevation soils hold less nutrients. Poorly drained soils hold more water so are more conducive to compaction, rutting and puddling. They are also more likely to have soil mixing, mineral soil exposure, topsoil displacement, erosion, or litter layer loss. Climate change stressors could exacerbate these effects by increasing soil vulnerability to harvest, with less reliable snow and frozen ground predicted during summers and less reliable freeze-thaw cycles to restore compacted soils.

Table 3-16. Acres harvested in areas with sensitive soil attributes for Alternatives B and C and their corresponding percent of the total acres proposed for harvest

Sensitive Soil Attribute	Acres Harvested with Attribute		Percent of Total Acres Harvested	
	Alternative B	Alternative C	Alternative B	Alternative C
Severe Erosion Hazard	723	681	7.6	7.6
Slopes dominantly greater than 35 percent	104	93	1.1	1.0
Shallow soil	45	45	0.5	0.5
Poorly drained soil	470	418	4.9	4.5
Above 2,500-foot elevation	439	412	4.6	4.6
Total[1]	**1,690**	**1,556**	**17.8**	**17.0**

[1] Total includes acres with at least one soil attribute.

The intensity and extent of soil disturbance can be lowered to acceptable levels by following Forest Plan standards and guidelines, Vermont Acceptable Management Practices, National Best Management Practices for Water Quality, and project specific mitigation measures for the protection of soil and wetland resources (Appendix B, Soil and Wetlands). For example, proposed stands above a 2,500-foot elevation may be considered for harvest per review by the Forest soil scientist where there is a clear rationale for a site-specific, special-case need for natural resource improvement. The review would consider the resource values specific to the stand, and site-specific soil-affecting parameters such as acid deposition, acid deposition critical load exceedance, aspect, plant communities, and harvest prescription. Trees would not be harvested within stands above 2,500 feet where additional sensitive soil parameters are present such as slopes greater than 30 percent, soils with a severe or very severe erosion hazard rating, shallow soils, or poorly drained soils. If no additional sensitive soil parameters are present, lower harvest intensities would be used (clearcutting and seed tree prescriptions would be avoided).

Monitoring of recently harvested timber sales on the Green Mountain National Forest has shown soil disturbance from harvest activities were generally below soil quality standard thresholds, and soil productivity outside of skid roads and landings appeared to be unaffected (Quintana 2020). Meeting the Somerset project soil quality standards would keep soil property changes to relatively low intensities, reducing the ecological risks of negatively affecting ecosystem components, functions or services to low.

Temporary Road Construction and Use

Research has consistently shown roads increase erosion more than any other forest management practice (Edwards, et al. 2016). The construction and use of temporary roads cause compaction, rutting, erosion, reduced soil productivity, and potential sediment deposition into wetlands and stream channels. Impacts vary by road width, level of maintenance, hydrologic changes made, imperviousness of road surfaces, and other factors. Soil properties within the road prism are altered to the degree where they do not resemble native soil properties after construction resulting in reduced surface water infiltration and loss of overall

long-term soil productivity. Road construction often involves complete removal of the forest litter and topsoil layers and removal of enough subsoil material to create the road base in cut locations. In fill locations, soil material excavated from the cut is placed over the native soil surface to bring the soil to grade for up to one-half the width of the roadbed.

Table 3-17 provides the miles of temporary roads proposed and associated acres of disturbance for both action alternatives. There would be 31.7 miles of temporary roads constructed for Alternative B affecting approximately 84.5 acres. Of the 31.7 miles of proposed temporary roads, 29.4 miles would follow existing non-system roads or trails affecting approximately 78.4 acres with road widening to 22 feet. The remaining 2.3 miles of temporary road would be constructed where there is no existing road or trail template resulting in 6.1 acres of detrimental soil disturbance.

Table 3-17: Proposed temporary roads for Alternatives B and C

Description	Alternative B		Alternative C	
	Length (miles)	Acres of disturbance[1]	Length (miles)	Acres of disturbance[1]
Follows existing non-system woods road/trail or system trail	29.4	78.4	16.6	44.3
New temporary road location[2]	2.3	6.1	0.8	2.1
Grand Total	**31.7**	**84.5**	**17.4**	**46.4**

[1] Assumes a 22-foot wide temporary road template.

[2] New temporary road construction needed where there is no existing road or trail template.

Table 3-18 provides the miles and acres of temporary roads proposed for construction and use to haul timber from harvest treatment areas (following existing non-system road and new road templates) for both action alternatives, as well as the percentage of the harvest impact area covered by temporary roads. Approximately 34.6 acres of new soil disturbance would occur from temporary road widening or construction for Alternative B. Together with the existing portions of road or trail templates being used for temporary roads, this represents 0.88 percent of the harvest impact area. Although this amount would contribute to the overall detrimental soil disturbance indicator (see Table 3-14), it is still anticipated the total would still be under the 10 percent threshold of acceptable impact.

Table 3-18. Proposed temporary roads following existing non-system road and new road templates for Alternatives B and C, and associated percent of total acres in the harvest impact area.

	Road Length (miles)	Total Acres Disturbed[1]	Additional Acres from Widening or New Construction[2]	Percent Acres of Temporary Roads in Harvest Impact Area[3]
Alternative B	31.7	84.5	34.6	0.88
Alternative C	17.4	46.4	18.2	0.52

[1] Assumes a 22-foot wide temporary road template.

[2] Assumes increased widening of existing non-system roads by 8 feet; and 22-foot wide template for new temporary road construction not following existing non-system road or trail template.

[3] The harvest impact area is the proposed harvest treatment acres plus acres covered by temporary roads. The harvest impact area for Alternative B is 9,628 acres (9,544 acres + 84.5 acres). The harvest impact area for Alternative C is 8,907 acres (8,861 acres + 46.4 acres).

Table 3-19 provides the miles of proposed temporary roads, associated acres in locations with sensitive soil attributes, and percent of the acres in the overall harvest impact area for Alternative B. Severity of effects depends on whether the road follows an existing road template where long-term soil productivity has already been reduced from past use.

Of the 2.3 miles of temporary roads proposed in locations not following existing non-system road or

trail templates, approximately 1.65 miles (4.4 acres) or 72 percent of the total new roads would be on soils with a severe erosion hazard rating (NRCS 2020). This indicates erosion is very likely when constructing temporary roads in these areas and erosion-control measures are very important to minimize soil erosion. Approximately 0.4 miles (0.7 acres), or 17 percent of the 2.3 miles of temporary road construction are proposed on poorly or very poorly drained soils (seasonal water tables within the top 20 inches of the soil surface). Risks of slope failure and gully erosion are substantially increased on these wet soils. Road construction and use in poorly drained soils can further reduce soil capacity to support plant growth. Approximately 0.07 miles (0.2 acres) or three percent of the 2.3 miles of temporary road construction would occur on slopes of 35 to 45 percent where slope failure is a concern. In all, approximately 4.5 acres, or 0.06 percent of the harvest impact area would be impacted by the construction of new temporary roads on soils with sensitive attributes.

Approximately 21.7 miles out of the 29.4 miles of proposed temporary roads following existing non-system road or trail templates have some degree of existing compromised resource conditions from past use such as soil compaction, ongoing erosion and gullying, and overall reduced soil productivity. These roads would cover approximately 57.8 acres of sensitive soils or 0.6 percent of the harvest impact area. The magnitude of soil quality effects from the construction of temporary roads in these locations is expected to be more than what has already occurred, mainly due to road widening. Adding road acres in locations where the instability and erosion risks are high contributes to adverse effects to soil health.

Even following erosion-control measures for all proposed temporary road construction, road cuts on very steep slopes would not likely attain full vegetative cover and would remain a continual source of sediment to ditch lines. Understory vegetation and some trees may colonize cutbanks and fillslopes over time, with the fill-slopes more likely to become vegetated quickly due to easier rooting in the unconsolidated soil, but even after decades, substantial portions of the road (especially cutbanks) would remain bare.

In addition to occupying soils with sensitive attributes, approximately 2.4 miles of temporary roads following existing non-system roads are within a wetland or within 100 feet of a wetland. The potential negative impacts to wetland function, including altering wetland hydrology or depositing fill, would be mitigated using a combination of winter use only, rerouting existing roads around wetlands and their buffers before use, or restoring wetland hydrology after use, using drainage structures or re-contouring or obliterating the road template (Appendix B, Soil and Wetlands).

Table 3-19. Temporary road construction and use in areas with sensitive soil attributes for Alternative B

Sensitive Soil Attribute	Existing Roads (miles)[1]	Existing Road (acres)[1]	Harvest Impact Area (percent)	New Roads (miles)[2]	New Roads (acres)[2]	Harvest Impact Area (percent)
Severe Erosion Hazard	20.32	54.2	0.56	1.65	4.4	0.05
Slopes over 35 percent	0.09	0.2	0.00	0.07	0.2	0.00
Shallow soil	0.00	0.0	0.00	0.00	0.0	0.00
Poorly or very poorly drained	2.14	5.7	0.06	0.40	1.1	0.01
Above 2,500-foot elevation	1.36	3.6	0.04	0.00	0.0	0.00
Total[3]	21.68	57.8	0.60	1.67	4.5	0.06

[1] Temporary roads following existing non-system road or trail template.
[2] Temporary roads not following existing non-system road or trail template.
[3] Total includes miles with at least one soil attribute.

In summary, most temporary roads proposed for use (29.4 miles or 93 percent of the total) follow existing road or trail templates. Although these temporary roads would include 0.6 percent of the harvest impact area where soils have sensitive soil attributes, most additional impacts would be in areas where soil productivity reduction has already occurred from past use. Of the 2.3 miles of proposed temporary roads not following existing road or trail templates, 1.67 miles of road would affect 4.5 acres in areas with sensitive soil attributes including severe soil hazard rating, wet soils, and steep slopes exceeding 30 percent. This amount compared to the total harvest impact area is very low (0.06 percent). Although this small amount would still have some adverse soil effects, it is not at a level for major concern.

Through proper planning, most negative soil and wetland resource effects from road construction and use can be minimized (Edwards, et al. 2016). Careful application of relevant Forest Plan standards and guidelines, Vermont Acceptable Management Practices, National Best Management Practices for Water Quality, and project specific mitigation measures (Appendix B, Soil and Wetlands) further reduce the effects to acceptable levels.

Road Maintenance and Closure

Operational Maintenance Level (OML) 1 Roads

Harvested timber would be hauled on 17.7 miles of existing Forest Service OML 1 system roads. There are no new system roads proposed for construction. Even well-maintained system roads can have a negative effect on soil and wetland quality from erosion and sedimentation. Consistent maintenance would minimize risks of erosion, sedimentation, and hillside failures (such as slippage) resulting in chronic or catastrophic soil-related problems. Anticipated reconstruction for improvements for some system roads prior to their use such as limited road widening, gravel placement, installing and/or repairing culverts, and ditching and shaping of roads would also minimize soil effects. Additionally, closure of OML 1 system roads following their use by removing drainage structures, blocking roads to prohibit motorized vehicle access, and performing basic custodial maintenance during non-use would further minimize resource effects.

Temporary Roads

The 31.7 miles of temporary roads proposed for timber harvest activities would be maintained during their use to ensure drainage structures properly function, thus limiting erosion and runoff. Temporary roads would be closed following their use for hauling harvested timber. Standard required Forest Service timber sale contract provisions such as removing bridges, culverts, and crossing structures, and blocking access to motorized vehicles would help stabilize soil and maintain natural stream hydrology. Additional restoration and stabilization of non-system roads is often essential to effectively implement Best Management Practices and meet resource restoration goals. This includes stabilizing and restoring disturbed areas to a more natural state, and sometimes requires obliteration, or recontouring. Mitigation measures for temporary road construction and closure are designed to address this need (Appendix B, Soil and Wetlands).

Although temporary roads are considered a short-term need limited to the time needed to implement timber harvest activities, their construction and use can have long-term adverse effects to soil quality. It is often difficult to revert soils in the road prisms back to functioning pre-construction conditions over the course of 20 to 30 years without substantial resources. For example, full gravel removal and return of the road template to pre-use conditions are not planned in all cases where it is not needed to address hydrologic function concerns. Although the conditions of many of the existing non-system roads proposed for use would be improved by standard closure activities, others may continue to degrade soil or wetland quality due to poor conditions pre-existing their use as temporary roads.

Temporary road closure required by standard Forest Service timber sale contract provisions, combined

with careful application of Forest Plan standards and guidelines, Vermont Acceptable Management Practices, National Best Management Practices for Water Quality, and project specific mitigation measures (Appendix B, Soil and Wetlands) would reduce levels of soil and wetland resource degradation associated with temporary road construction and use to acceptable levels.

Land Clearing (Compartment 102/Stand 10)

Up to 66 acres are proposed for land clearing with root wad removal to create a permanent upland opening in Compartment 102/Stand 10. This would affect about 9.4 percent of a 702-acre drainage basin of the Headwater Deerfield River subwatershed. Using heavy machinery for land clearing and root wad removal could severely and irreversibly degrade these soils by causing excessive bare soil exposure, topsoil displacement, compaction, and mixing of topsoil and subsoil. These changes can also increase the likelihood for the introduction of non-native invasive plants and earthworms to this site. With the application of the mitigation measures specific to root wad removal and non-native invasive plant control, negative soil resource effects associated with proposed land clearing and root wad removal would be limited to the site. As a result, erosion resulting in sedimentation of the Deerfield River would remain within acceptable levels and would not have adverse effects related to water quality and other attributes of aquatic habitat (Appendix B, Non-native Invasive Plants; and Soil and Wetlands).

Prescribed Fire

Approximately 889 acres are proposed for prescribed burning including up to 221 acres of site preparation for oak regeneration and up to 668 acres for maintenance of permanent upland openings. Relatively little compaction, soil displacement, litter layer loss or displacement, or nutrient loss would occur as a result of prescribed fire use including fire line construction. Some compaction and rutting may occur from limited use of off-highway vehicles for prescribed fire activity. Overall effects would be minimized to acceptable levels by following Forest Plan standards and project specific mitigation measures (Appendix B, Soils and Wetlands).

3.7.4.3 Alternative C: Reduced Roads

The soil and wetlands resource effects for Alternative C would be the same as the effects disclosed for Alternative B except for the following differences.

Soil Restoration

There would be stabilization of soil conditions proposed for 10.9 miles of existing non-system roads to check or reverse ongoing negative soil effects compared to 10.8 miles for Alternative B.

Timber Harvest Activities

Landing needs were based on limiting skidding distances up to 0.75 miles (approximately 4,000 feet) compared to approximately 2,500 feet for Alternative B. As a result, 97 landings are proposed for construction and use affecting up to 47.5 acres or 0.5 percent of the total proposed harvest area.

Many of the existing non-system roads and trails proposed for temporary road in Alternative B not proposed for Alternative C would instead likely be used as skid trails. This would result in less severe soil disturbance since no cut or fill to widen roads and gravel application would be needed, and there would be less compaction without loaded log trucks using the roads.

Steep slopes and shallow, poorly drained, and high-elevation soils cover approximately 1,556 acres or 17 percent of the proposed timber treatment area acres (see Table 3-16). This is a reduction of approximately eight percent in acres compared to Alternative B.

Temporary Road Construction and Use

There would be a total of 17.4 miles of temporary road construction for Alternative C (see Table 3-17). Out of this total, 16.6 miles would follow existing non-system roads or trails affecting approximately 44.3 acres. The remaining 0.8 miles of temporary road would be constructed where there is no existing road or trail template, resulting in approximately 2.1 acres of new soil disturbance. The 17.4 miles of temporary roads would reduce the amount of total soil disturbance to 46.4 acres which is about 45 percent less compared to Alternative B. Approximately 18.2 acres of new soil disturbance would occur from temporary road widening or construction for Alternative C. Together with the existing portions of road or trail templates being used for temporary roads, this represents 0.52 percent of the harvest impact area which is about 41 percent less than Alternative B (see Table 3-18).

Table 3-21 provides the miles of proposed temporary roads, associated acres in locations with sensitive soil attributes, and percent of the acres in the overall harvest impact area for Alternative C. Approximately 12.5 miles of proposed temporary roads following existing non-system road or trail template cover 33.4 acres with sensitive soil attributes or 0.38 percent of the harvest impact area. This is a 37 percent reduction compared to Alternative B. Approximately 0.62 miles of proposed temporary roads not following existing non-system road or trail template cover 1.7 acres with sensitive soil attributes or 0.02 percent of the harvest impact area. This is a 67 percent reduction compared to Alternative B.

Table 3-21. Temporary road construction and use in areas with sensitive soil attributes for Alternative C

Sensitive Soil Attribute	Existing Roads (miles)[1]	Existing Road (acres)[1]	Harvest Impact Area (percent)	New Roads (miles)[2]	New Roads (acres)[2]	Harvest Impact Area (percent)
Severe Erosion Hazard	12.20	32.5	0.37	0.62	1.7	0.02
Slopes over 35 percent	0.04	0.1	0.00	0.00	0.0	0.00
Shallow soil	0.00	0.0	0.00	0.00	0.0	0.00
Poorly or very poorly drained	1.51	4.0	0.05	0.17	0.5	0.01
Above 2,500-foot elevation	0.05	0.1	0.00	0.00	0.0	0.00
Total[3]	12.54	33.4	0.38	0.63	1.7	0.02

[1] Temporary roads following existing non-system road or trail template.

[2] Temporary roads not following existing non-system rod or trail template.

[3] Total includes miles with at least one soil attribute.

Approximately 1.2 miles of temporary roads following existing non-system roads are within a wetland or within 100 feet of a wetland. This is 50 percent less miles compared to Alternative B.

In summary, Alternative C would result in substantially less effects associated with most temporary road construction and use indicators of detrimental reductions in long-term soil productivity. This would result in a proportionate reduction in soil compaction, erosion, reduced soil productivity, and damage to wetland functions compared to Alternative B.

3.7.5 Cumulative Effects

The cumulative effects analysis area for soil and wetlands includes all lands within the Somerset project area. This analysis area was selected primarily because soil disturbance in response to management activities such as those in Alternatives B and C rarely extend beyond the immediate impact area (for example, a harvest unit, mowed permanent upland opening, or a constructed trail). The temporal context for cumulative effects to soils is 10 years into the past and 40 years into the future, since proposed harvesting for this project is expected to occur over the next 10 years and effects to soil resources like

compaction in temporary haul roads can last at least 30 years. The temporal context for cumulative effects for wetlands is 10 years into the past and future.

There is no timber harvesting planned on National Forest System lands beyond activities proposed in the Somerset project. Past and future harvesting on state and private lands has been and is expected to remain minimal. There is no temporary or permanent road construction associated with the Early Successional Habitat Project or other past and ongoing projects within the Somerset project area.

Soil Productivity

In addition to the approximately 9,544 acres proposed for timber harvest and wildlife opening treatments in Alternative B and 8,861 acres in Alternative C, it is unknown specifically how much timber harvest will occur over the next 10 years on state or private lands, but the amount is expected to be minimal. It is also unknown how much land conversions for private development, and road and trail construction will occur.

Table 3-22 provides the cumulative effects associated with temporary road construction and use for both action alternatives. There are 53 miles of existing non-system roads or trails within the harvest impact area occupying 89.9 acres or 0.93 percent of the total area. The construction and use of temporary roads for Alternative B would increase the area affected to 124.5 acres or 1.23 percent of the harvest impact area. Approximately 6.1 acres or less than 0.01 percent of the harvest impact area would be affected by road construction in locations without an existing road or trail template. The construction and use of temporary roads for Alternative C would increase the area affected to 108.1 acres or 1.21 percent of the harvest impact area. Approximately 2.1 acres or a negligible percent of the harvest impact area would be affected by road construction in locations without an existing road or trail template.

These affected areas for both alternatives would have soil disturbance detrimental to long-term soil productivity which is not expected to be reversed or restored for at least 20 to 30 years following use. Although this amount would contribute to the overall detrimental soil disturbance indicator (see Table 3-14), it is still anticipated the total would still be under the 10 percent threshold of acceptable impact.

Table 3-22. Cumulative effects from proposed temporary roads for Alternatives B and C

Road Length (miles)	Total Acres Disturbed[1]	Additional Acres from Widening or New Construction[2]	Percent Acres of Temporary Roads in Harvest Impact Area	Existing and New Temporary Roads in Harvest Impact Area (acres/percent)	
				Acres	Percent
Existing non-system roads or trails					
53.0	89.9	0	0.93	89.9	0.93
Alternative B: *Temporary roads following existing non-system road/trail and new road template*					
31.7	84.5	34.6	0.88	124.5	1.23
Alternative C: *Temporary roads following existing non-system road/trail and new road template*					
17.4	46.4	18.2	0.52	108.1	1.21

[1] Assumes a 22-foot wide template for proposed temporary roads.

[2] Assumes increased widening of existing non-system roads by 8 feet; and 22-foot wide template for new temporary road construction not following existing non-system road or trail template.

Timber harvest in combination with past and current acid deposition in the higher elevations of the project area can also deplete important nutrient pools and degrade long-term soil productivity (Caputo et al. 2016). Incoming atmospheric sulfur and nitrogen deposition has likely caused soils in the higher elevations of the project area to become more acidic with important nutrients such as calcium and magnesium being leached from the soils. Based on the most recent model available, all of the analysis

area is identified as having sulfur plus nitrogen deposition in excess of the critical loads for mycorrhizal fungi, herbaceous plants and shrubs, forests, and nitrate leaching indicating these ecosystem components do not have any additional capacity to buffer incoming acids. Soil acidification, due to atmospheric deposition, will continue to deplete calcium from forest soils. Over the long-term, this could impair soil and ecosystem productivity. Forest decline, including reductions in tree growth and/or vegetative community species composition, is a likely indicator of soil productivity loss (USDA Forest Service 2005). There is, however, no evidence of broad-scale forest decline at middle and lower elevations of the Green Mountain National Forest, where most of the project area is located. The effects of atmospheric deposition on state and private lands are similar to those on National Forest System lands.

Predicted increasing amount and intensity of precipitation due to climate change, plus increasing water infiltration into the soil during warmer winters may increase rates of soil leaching losses of soil calcium and magnesium, and nitrogen (Rustad et al. 2012).

To conclude, cumulative losses in soil productivity are possible within the analysis timeframe, because atmospheric deposition influenced by climate change may cause a reduction in forest productivity.

Wetlands

Wetland values include wetland plant and animal habitats, flood storage, water purification, carbon storage, and nutrient cycling. There are no known wetland losses in extent on National Forest System lands over the past 10 years within the analysis area. If wetland extent has changed over the decade, it was likely due to changes in the level of beaver activity. In addition, wetland losses are not expected to increase in the future, because no new temporary roads are proposed to be built within wetlands or their buffer, and the minimal harvest proposed within wetlands are designed to protect, manage, and improve the wetland conditions.

There is no data on losses in wetlands on non-National Forest System lands over the past 10 years. Some losses have probably occurred on private lands, though they are probably small. There are some limited ongoing threats to wetland values on private lands and is particularly evident where wetlands are being used as agricultural lands or development is on-going. With increasing awareness of the public about the importance and values of wetlands, acreage may increase slightly due to wetland restoration efforts in the watershed.

Given this information, cumulative losses in wetland quantity or values in the analysis area in response to past, present, and future actions, is small, because actions on National Forest System lands are unlikely to result in losses in wetland quantity or values, and similar wetland losses on state and private lands have been, and are expected to be small in the future due to state and federal wetland regulations.

3.8 Recreation

This section includes the disclosure of effects related to recreation resources including trails, eligible scenic and recreational rivers, visuals, wilderness and inventoried roadless areas.

3.8.1 Issues

Table 3-23 provides the relative issues (see Chapter 1, Section 1.4), indicators for effects and acceptable effects thresholds associated with the recreation resource.

Table 3-23. Issues, indicators and thresholds for recreation resource effects

Issue Statement	Indicator	Threshold
Decommissioning snowmobile trails could negatively impact the snowmobile user experience.	Deterioration of snowmobile user experience.	Reduction of trails causes a measurable adverse impact to the snowmobile user experience.
Timber harvest activities could negatively impact the snowmobile user experience when haul or skidding takes place on or across trails.	Closure or disruption of snowmobile trail use.	Trail closure or disruption causes unacceptable decrease in the snowmobile user experience.
Timber harvest activities could negatively impact scenery as observed by cross-country skiers on the Catamount Trail.	Visual quality objectives (Forest Plan, Chapter 2, Tables 2.3-2 and 2.3-3).	Does not meet visual quality objectives.
Management activities could degrade the eligibility of identified recreational or scenic rivers for future inclusion in the National Wild and Scenic River System.	Classification characteristics and outstandingly remarkable values for potential recreational or scenic river designation (Forest Plan, Chapter 3, Eligible Wild, Scenic, and Recreational Rivers Management Area).	Desired conditions are not met to retain recreational or scenic river eligibility.

3.8.2 Direct and Indirect Effects Analysis Area

The analysis area for effects related to trails is the Somerset project area and the following incorporated towns within and surrounding the project: Sunderland, Stratton, Wardsboro, Dover, Wilmington, Searsburg, and Woodford, because effects of the proposed activities are not expected to extend beyond this area. The analysis area for effects related to scenery along the Catamount Trail and future eligibility for recreational and scenic designation are in locations where management activities could directly or indirectly affect these resources.

The timeframe for the analysis is 10 years, because this is the expected period for proposed actions to be implemented and the potential effects to recreation resources to be apparent.

3.8.3 Affected Environment

Recreation

The project area offers a variety of year-round dispersed (such as trails and viewing wildlife) and developed (such as camping and day use areas) recreation opportunities. Several of the communities surrounding the project area benefit economically from the variety of recreation opportunities offered on National Forest System lands.

The project area has been managed for multiple uses, including the coexistence of recreation and vegetation management, since its inception as a National Forest. Evidence of past vegetation management activities is apparent in the form of existing skid trails, National Forest System roads, and in the existing forest stand composition and age class. Existing trails within the project area often lie on former town roads, skid trails, and secondary or abandoned logging roads. Past Forest Service harvesting within the project area has periodically facilitated as well as impacted recreation use; however, in both cases, harvest activities were of relatively short duration and did not cause long-term disruption to recreation opportunities.

There are approximately 110 miles of National Forest System trails within the project area (Appendix C). These trails provide multiple recreational uses including snowmobiling, mountain biking, hiking,

horseback riding, and cross-country skiing. About 70 miles of trail are managed for snowmobile use. Hiking trails include the Appalachian Trail and Long Trail which coincide in the project area and are recognized as a National Scenic Trail and a National Recreation Trail, respectively. Significant Forest Service developed recreation sites include Grout Pond and Somerset Airfield campgrounds and the Mount Snow Ski Area which is operated under a ski area term special use permit.

Scenery

Visual resources within the project area include views from Vermont Scenic Byways Routes 9 and 100. The scenic elements to be viewed from these corridors include the Deerfield River, Harriman Reservoir, numerous small streams, steep side slopes and ridgelines of the Green Mountains, and characteristic Vermont villages. Other travel corridors within the project area include Forest Road 71, Somerset Road, Handle Road, and the Stratton-Arlington (Kelly Stand) Road. Key observation points from these roads include views of Shep Meadow, Haystack Mountain, Mount Snow, Deerfield River, and other streams. Valued views from the Catamount Trail near proposed activities are of mature forest with filtered views of Somerset Reservoir in some locations.

Eligible Wild & Scenic Rivers

The Wardsboro Brook and Deerfield River are identified as eligible for potential addition to the National Wild and Scenic River System (USDA Forest Service 2006a) (see Map 1, Existing Condition):

- Wardsboro Brook is an eligible Recreational River with 'Recreation' and 'Scenic' outstandingly remarkable values
- Deerfield River is an eligible Scenic River with 'Hydrologic' and 'Wild' outstandingly remarkable values

Although neither river is currently a congressionally authorized study river, the rivers' eligibility for future addition to the National Wild and Scenic Rivers System is protected by Forest Plan standards and guidelines for the Eligible Wild, Scenic, and Recreational Rivers Management Area.

3.8.4 Direct and Indirect Effects

3.8.4.1 Alternative A: No Action

The project purpose to provide a more diverse range of high quality, sustainable recreation opportunities which complement those provided off National Forest System lands would not occur including:

- New trail access and connectivity would not be provided including in the Handle Road area
- Non-sustainable existing trails would remain on the National Forest trail system and continue to present resource and safety concerns
- Existing inadequate water, sanitation, user capacity and water and soil resource degradation conditions at Grout Pond Campground would persist and worsen
- Opportunities to enhance views at various vistas along the Appalachian/Long Trail, Deerfield Ridge, and Forest Road 71 would not be realized

There would be no effect associated with visual resources from management activities including along the Catamount Trail. Additionally, the eligibility of the Wardsboro Brook or Deerfield River for future potential addition to the National Wild and Scenic Rivers System would not be affected.

3.8.4.2 Alternative B: Proposed Action

The proposed action would move the desired condition for recreation closer to the diverse range of high quality, sustainable recreation opportunities which complement those provided off National Forest System lands within the project area. Proposed activities providing this type of opportunity include:

- Providing a backcountry ski area accessed via Handle Road
- Providing mountain bike trails accessed via Handle Road
- Reducing the number of trails that cannot be sustainably maintained
- Making sound trail investment decisions given predicted impacts from climate change
- Improving Grout Pond Campground to meet accessibility, recreation experience, public health and safety, and shoreline resource condition site goals

Recreation - Trails

The decommissioning of the East Deerfield Loop (Forest Trail 377), Deerfield River (Forest Trail 379), and Sports Cabin (Forest Trail 380) snowmobile trails would close 4.1 miles (about six percent) of the existing 70 miles of snowmobile trail within the project area. Effects to the snowmobile user experience resulting from decommissioning this small amount of snowmobile trail miles would likely be minimal. Furthermore, the Deerfield River Trail has been missing a significant bridge since it was destroyed in Tropical Storm Irene in 2011. Many sections of trail are also experiencing resource damage when they are used where they are excessively wet during inconsistent freezing conditions. The inadequate infrastructure and poor trail conditions along these trails pose safety concerns and negatively impact the experience for snowmobile trail use. In addition to the resource damage caused by snowmobilers avoiding unfrozen sections of trail tread, the East Deerfield Loop Trail leads to the edge of Somerset Reservoir. The Forest Service, Vermont Association of Snow Travelers, and Great River Hydro do not support snowmobiling over bodies of water which frequently occurs on the reservoir.

Effects to the snowmobile user experience due to timber harvest activities would be limited in duration and scope, and be isolated in time and space to the locations of anticipated Somerset project timber sales. Project specific mitigation measures would maintain trail continuity as much as possible and ensure communication occurs between Forest Service and Vermont Association of Snow Travelers staff regarding trail sharing, rerouting, signing, and/or temporary closures prior to and during timber sale operations (Appendix B, Recreation). As a result, negative effects associated with the snowmobile user experience would be minimal.

Scenery

The application of Forest Plan scenery management guidelines and project specific mitigation measures (Appendix B, Recreation) would result in minimal impacts to visual quality objectives. Treatments along the Catamount Trail (and any other trail within the project area) would be limited to openings up to one-half acre in size with irregular shape for group selection and trail-side openings would be limited to 200 feet with at least 1,000 feet between openings. The Visual Quality Objective for areas with expressed concern for scenery along the Catamount Trail (Compartment 150/Stands 9, 10, 11 and 27 and Compartment 105/Stand 1) is Partial Retention. This objective means human alterations must appear subordinate within the surrounding natural landscape. Treatments within the project area may be visible to Forest visitors for a short period of time, approximately five years following harvest activities, but Visual Quality Objectives would still be met and effects associated with the backcountry experience would be minimal.

Eligible Wild & Scenic Rivers

Effects associated with classification characteristics and outstandingly remarkable values for potential recreational or scenic river designation for Wardsboro Brook and Deerfield River respectively, will not reduce the eligibility for their potential addition to the National Wild and Scenic Rivers System.

As an eligible recreational river, the desired future condition of Wardsboro Brook allows for substantial evidence of human activity along the shoreline. The proposed treatments within a quarter-mile on either side of the river are a mix of even and uneven-aged management, but uneven-aged management has been emphasized. There are approximately 59 acres proposed for even-aged management (40 percent of proposed treatment) and about 89 acres proposed for uneven-aged management (60 percent of proposed treatment) within the Wardsboro Brook management area corridor. Forest Plan guidelines for timber management in eligible recreational classification river segments would be met. The only proposed stand that would be directly adjacent to the river would be group selection of four acres within a 23-acre harvest unit (Compartment 176, Stand 16). A 25-foot buffer along the river's edge would soften the appearance of the treatment from the river (Forest Plan, Chapter 2, Section 2.3.2 protection guideline). The outstandingly remarkable value of "Scenic" would be minimally affected in scale and time as the small area proposed for group selection would only be apparent to the casual Forest visitor about five years following harvest. The outstandingly remarkable value of 'Recreation' would be unaffected.

Proposed management activities within the Deerfield River scenic corridor (quarter-mile from each side of the river) include the maintenance of existing upland openings, large wood placement, and harvest treatments including shelterwood, single-tree selection, group selection, improvement, thinning and patch clearcuts. Approximately 57 acres of permanent openings (13 percent of treatments), 146 acres even-aged management (32 percent of treatments), and 248 acres of uneven-aged management (55 percent of treatments) are proposed within the Deerfield River scenic corridor. Timber management guidelines would be met for this management area, as uneven-aged management is emphasized, and water and visual quality objectives would be met. Wildlife and fisheries guidelines would be met as proposed fish habitat improvements would not affect the free-flowing characteristics of the river. Like the Wardsboro Brook corridor, a 25-foot buffer along the river's edge would soften the initial appearance following logging. Treatment activities would be consistent with the existing landscape character of moderate visible evidence of human-created change. The outstandingly remarkable values of 'Hydrologic' and 'Wild' would be unaffected or improved with the wood placement activities.

3.8.4.3 Alternative C: Reduced Roads

Eligible Wild & Scenic Rivers

Effects to eligible wild & scenic rivers would be similar to those disclosed for Alternative B. The four acres of group selection harvest in the 23-acre stand (Compartment 176, Stand 16) directly adjacent to Wardsboro Brook would not be included in Alternative C. This would result in a slight reduction in effects for the outstandingly remarkable value of "Scenic" within the Wardsboro Brook management corridor. Effects to the outstandingly remarkable value of "Recreation" within the corridor would remain the same compared to Alternative B. All effects to the eligible (scenic) Deerfield River outstandingly remarkable values of "Hydrologic" and "Wild" would be the same as in Alternative B. Both rivers (Wardsboro Brook and Deerfield River) would continue to maintain eligibility in the wild and scenic river program.

Recreation

Effects to the overall recreation opportunities, including snowmobile trail use, would be similar to those disclosed in Alternative B. There would be 2.2 fewer miles of system snowmobile trails proposed for temporary road for timber harvest activities compared to Alternative B (5.3 miles and 7.5 miles for

Alternatives C and B, respectively). This difference in temporary road construction and use may have slight but negligible changes in effects to snowmobile trail continuity.

Scenery
Effects to scenery would be similar to those disclosed in Alternative B. Reduction in timber harvest may result in slight beneficial changes in effects for visual resources but without quantitative differences.

3.8.5 Cumulative Effects

The cumulative effects analysis area associated with recreation resources is the same used to analyze direct and indirect effects. The area of analysis was chosen because it includes all areas on which other projects may have combined effects with Somerset proposed activities. The cumulative effects analysis takes into account activities occurring up to 10 years in the past to10 years after project implementation is complete. This timeframe was chosen because it is a reasonable length of time for measuring past effects and for considering foreseeable future projects.

There are no timber harvest or other management activities anticipated on National Forest System lands beyond those proposed in the Somerset project except routine road, trail and campground maintenance activities. Minimal amounts of timber harvest is anticipated on private lands and none would occur on state lands. Recreation trails and backcountry ski areas are anticipated to be constructed in the Town of Dover on town and other non-Forest Service lands. These recreation areas and trails would have connectivity to the proposed trails and backcountry ski area off Handle Road via the Crosstown Trails.

Recreation
Timber sale and other vegetation management activities on private lands within the project area could have cumulative effects on snowmobile trail continuity if hauling and/or skidding operations take place over snowmobile trails. Timber sales and vegetation management on Great River Hydro lands or private lands within the project area have a chance of overlapping in time and space with the Somerset project timber sales.

Development of hiking, biking, and non-motorized winter use trails on a newly acquired Town of Dover property off of Route 100 could increase recreation demand. The area is connected to the proposed trailhead off Handle Road via the Crosstown Trails and may increase use in the area. The proposed recreation activities would support this increased demand, and cumulative effects would be minimal.

Scenery
Timber sale and other vegetation management activities on private lands within viewsheds containing proposed activities may have some cumulative effects to scenery. Given the spacing in time and location and low chance of overlap, cumulative effects would be minimal and visual quality objectives would still be met.

Eligible Wild & Scenic Rivers
Given no past, present or future projects are known to occur within the Deerfield River scenic or Wardsboro Brook recreational river corridors beyond those proposed in this project, there would be no cumulative effects anticipated.

3.9 Heritage

Section 106 of the National Historic Preservation Act requires federal agencies to consider the effect of a project on any district, site, building, structure, or object included in, or eligible for inclusion in the National Register.

3.9.1 Issues

Table 3-24 provides the relative issue (see Chapter 1, Section 1.4), indicator for effects and acceptable effects threshold associated with heritage resources.

Table 3-24. Issue, indicator and threshold for heritage resource effects

Issue Statement	Indicator	Threshold
Management activities could disturb heritage resources within the project area; heritage sites should be protected.	The proximity of the various proposed activities to heritage resources.	When an activity destroys, damages, alters, or removes a property or its characteristics or place the heritage value of the resource at risk.

3.9.2 Direct and Indirect Effects Analysis Area

Heritage resource sites are discrete places on the landscape and their physical integrity is completely dependent on their specific locale. The direct and indirect effects analysis area for a given heritage resource is generally restricted to the areas directly and physically affected by a proposed project or activity. The "Area of Potential Effect" (APE) is the maximum total acreage proposed for project activities. This would also include any ancillary areas such as landings, access routes or trail re-routes occurring outside of specific sites within the project area. The timeframe for the effects analysis is up to 10 years which is the approximate number of years expected to implement all approved activities that could affect heritage resources.

3.9.3 Affected Environment

Heritage resources refer to archaeological and historic sites. Known heritage resource sites on the Green Mountain National Forest primarily consist of the remains of historic period farmsteads (such as cellar holes and barn/outbuilding foundations), mills, schools, cemeteries, stone walls, transportation corridors, and industrial sites (charcoal kilns). These are the most frequently encountered and readily discernible types of archaeological sites. Other more recent historical sites include standing structures (such as Forest Service buildings, fire towers, and Appalachian Trail or Long Trail shelters) meeting the 50-year threshold to be considered in federal undertakings. Also present are the archaeological remains of Native American resource procurement, hunting, and habitation sites.

The National Historic Preservation Act, as amended, and its implementing regulations at 36 CFR 800, defines heritage resources to be considered significant if they meet the criteria for inclusion to the National Register of Historic Places. These significant resources are referred to as "historic properties." The Forest Plan specifies protection and stewardship will be provided to significant heritage resources on the Green Mountain National Forest (Forest Plan, Chapter 2.2, Goal 16).

Only portions of the Somerset project area have been surveyed for heritage resources. There are 24 known and previously recorded heritage resource sites within the proposed treatment areas. These sites include a number of old logging camps, kilns, mills, cemeteries, numerous farmsteads, and the Somerset School House. The exact location of these sites is protected from public disclosure under the Archaeological Resources Protection Act (16 CFR 470hh). Since the entire project area has not been surveyed, additional site specific archeological survey areas would be determined and surveys completed annually based on the location of proposed ground disturbing management activities that may be implemented each year. This would include timber harvest treatments and associated roads, landings and skid trails, wildlife and aquatic improvement treatments, soil restoration, and recreation activities.

3.9.4 Direct and Indirect Effects

This section provides a general disclosure of anticipated effects to heritage resources if management activities are approved and implemented as proposed. The various activities comprising the Somerset project, including timber harvest and road construction, have the potential to disturb archaeological remains through ground disturbing activities.

3.9.4.1 Alternative A: No Action

There would be no adverse effect associated with any heritage resource site known to occur within the APE from the Somerset project since no ground disturbing activities would be conducted. Also, no restoration or maintenance would occur to the Somerset School House.

3.9.4.2 Alternative B: Proposed Action

Any management activity proposed resulting in ground disturbance has the potential to have a direct adverse effect to the condition of historic properties; however, implementation of site-specific mitigation measures would negate this potential (Appendix B, Heritage). Forest Service staff responsible for implementing activities and the Forest Archaeologist can work to develop strategies to ensure project success while having no effect on historic properties. Additionally, some of the proposed activities would have positive effects to the condition of historic properties through site identification, protection, stabilization, and development of interpretation materials for select sites emphasizing the historical richness of the area. This is especially true for the Somerset School House where structure site restoration would occur.

3.9.4.3 Alternative C: Reduced Roads

The heritage resource effects for Alternative C are the same as those disclosed for Alternative B.

3.9.5 Cumulative Effects

The National Historic Preservation Act includes protection of sites ("historic properties") that are significant at the local, state and national levels. Section 106 of the Act, as amended, obligates federal agencies to account for any impacts or effects to such sites. Because archaeological and historical sites are, for the most part, bounded places on the landscape, their conditions vary based on their location on the landscape. Over the last two or three decades, various management activities within the Somerset project area have been implemented with little or no effect to heritage resources. An exception to this statement may be the occasional breach of a stone wall for people and equipment to gain access to a specific compartment or stand. With no anticipated direct or indirect effects to specific, concrete remains of sites or their historic context within the project area, there are typically no cumulative effects.

3.10 Carbon and Greenhouse Gas Emissions

Forests play an important role in the global carbon cycle by taking up and storing carbon in plants and soil. Forestry has gained attention in recent decades because of its potential to influence the exchange of carbon with the atmosphere, either by increasing storage or releasing carbon emissions. Forests have a carbon "boom and bust" cycle. They take up and store atmospheric carbon as they grow through photosynthesis and release carbon through mortality due to aging or disturbances. Following mortality events, forests regrow, and the cycle continues. Forests can store carbon in soils and plant material as well as in harvested wood products outside of the forest ecosystem. In addition, wood fiber can be used to substitute for products that are more energy-intensive to produce, such as concrete and steel, creating a substitution effect which can result in lower overall greenhouse gas (GHG) emissions.

A complete and quantitative assessment of forest carbon stocks and the factors that influence carbon trends (management activities, disturbances, and environmental factors) for the Green Mountain National Forest is available in the project record (Dugan et al., 2019). This carbon assessment contains additional supporting information and references.

3.10.1 Issues

Table 3-18 provides the relative issue (see Chapter 1, Section 1.4), indicator for effects and acceptable effects threshold associated with the carbon resource.

Table 3-25. Issue, indicator and threshold for carbon resource effects

Issue Statement	Indicator	Threshold
Timber harvest activities could reduce the forest's ability to sequester carbon and mitigate greenhouse gas emissions.	Amount of carbon loss from forested stands. Amount of carbon emitted into the atmosphere.	Levels of carbon loss results in the forest to shift from a carbon sink to a carbon source. Levels of carbon emitted into the atmosphere has a measurable adverse effect.

3.10.2 Direct, Indirect and Cumulative Effects Analysis Area

The direct and indirect effects analysis area for carbon includes forested lands within the Green Mountain National Forest because carbon stock effects from proposed timber harvest and prescribed burning treatments within the Somerset project area are more meaningful at a forest-wide landscape level. The effects analysis for greenhouse gas emissions is the global atmosphere given the mix of atmospheric gases can have no bounds. The short-term timeframe for the effects analysis is 10 years because all harvest activities should be completed during this period. The mid-term timeframe for the effects analysis is approximately 30 to 70 years after harvest is complete when forest development is at the stage when many of the harvest areas are expected to be at their highest rate of carbon sequestration. The long-term timeframe is beyond this period until the forest approaches old growth status of 170+ years of age when ecosystem carbon storage approaches maximum potential (Cantazaro and DAmato 2019; USDA Forest Service 2006b).

The cumulative effects analysis area is the same as direct and indirect effects. The timeframe for the cumulative effects analysis is 15 years in the past and into the future similar to direct and indirect effects to account for other harvest activity that has occurred and will continue to occur on National Forest System lands.

3.10.3 Affected Environment

The carbon legacy of the Green Mountain National Forest is tied to the history of Euro-American settlement, land management, and disturbances. As the first region to be widely settled in the United States, eastern forests have had a long history of intensive harvesting and conversion of forests to agriculture. Historical disturbance dynamics, forest regrowth and recovery, and forest aging have been most responsible in driving carbon accumulation trends since 1950. Forest ecosystem carbon stocks on the Green Mountain National Forest increased 48 percent from 1990 to 2013 which provides strong evidence the Forest is maintaining a carbon sink (Dugan et al. 2019, USDA Forest Service 2015c).

According to satellite imagery, timber harvest has been the dominant disturbance type on Eastern Region National Forests including the Green Mountain National Forest from 1990 to 2011, although harvesting has typically affected no more than 0.25 percent of the forested area annually (Dugan et al. 2019, Birdsey et al. 2019). During this period, about 1.4 percent of the forested area experienced some level of harvest

including even-aged (clearcut, seed tree, shelterwood, and thinning) and uneven-aged (individual and group selection) treatments. Carbon losses from the forest ecosystem associated with harvests have been relatively small compared to the total amount of carbon stored in the forest, with losses from 1990 to 2011 equivalent to about 0.4 percent of non-soil carbon stocks (Dugan et al. 2019). However, these estimates represent an upper bound, because they do not account for continued storage of harvested carbon in wood products or the effect of substitution. Furthermore, the negative effects on carbon stocks caused by harvest, disturbances, and environmental conditions have been modest and exceeded by forest growth.

3.10.4 Direct, Indirect and Cumulative Effects

3.10.4.1 Alternative A: No Action

There would be no timber harvest treatments implemented under Alternative A, and thus no removal of trees from the project area. Existing carbon stocks would remain relatively stable in the short-term. However, in the absence of commercial timber harvesting on the stands where harvesting is proposed under the action alternatives, the forest will thin from mortality-inducing natural disturbances and other processes resulting in dead trees that will decay in the long-term, emitting some carbon to the atmosphere. About 76 percent of Green Mountain National Forest stands are over 80 years old with generally low rates of new stand development (Dugan et al. 2019). The Somerset project area is similar to the overall national forest with about 75 percent of forested stands over 80 years old. As the forest within the project area continue to age, stands will accumulate additional carbon in the absence of other forest disturbances. However, the rate of carbon accumulation in forest carbon stocks would slow as the forest approaches old-growth status (170+ years old) and maximum levels of carbon storage (Cantazaro and DAmato 2019).

3.10.4.2 Alternative B: Proposed Action and Alternative C: Reduced Roads

The proposed timber harvest would be conducted on approximately 9,544, and 8,861 acres under Alternatives B and C, respectively. This scope and degree of change would be minor for each alternative, affecting a maximum of about 2 percent of forested lands on the Green Mountain National Forest. Both Alternatives B and C also propose up to 889 acres of prescribed fire for site preparation following harvest or maintenance of permanent upland openings. The effect of the proposed timber harvest focuses on aboveground carbon stocks stored in live woody vegetation, which comprise about 40 percent of the total ecosystem carbon stocks of the Green Mountain National Forest (Dugan et al. 2019, USDA Forest Service 2015c). The effect of the prescribed fire focuses on the understory and forest floor, which comprises 14 percent of Forest-wide ecosystem carbon stocks. About 34 percent or more of the ecosystem carbon is in the mineral soils, a very stable and long-lived carbon pool (Dugan et al. 2019, McKinley et al. 2011, USDA Forest Service 2015c, Domke et al. 2017).

Timber Harvest

According to the International Panel on Climate Change, the appropriate way to consider the effects of forest management is taking the viewpoint of the atmosphere when considering impacts of carbon (IPCC 2007). That is, what the atmosphere actually "sees" in terms of carbon entering or leaving the atmosphere. This requires considering how management influences forest carbon stocks, emissions, and fate of carbon in harvested wood products and associated substitution effects. As such, harvesting and the use of harvested wood products can play an important role in reducing carbon emissions along with management for healthy forests.

Harvesting activities would remove carbon stored in forested stands within the Somerset project area at differing rates depending on the harvest method prescribed. Although forest harvest would result in some initial loss of carbon to the atmosphere when just considering ecosystem carbon stocks, losses are

expected to be replaced over time as the stands regrow. After reaching peak primary productivity (maximum carbon sequestration rate) in the first few decades, forest stands continue to sequester and store carbon as they age to maturity, but at lower rates (McKinley et al. 2011, Cantazaro and DAmato 2019). The specific time forested stands recover from carbon removed following harvest depends on many factors at the site-specific level such as harvest method, forest type, soil productivity, and growing conditions.

Initial ecosystem carbon loss would be mitigated within the project area since most stands in both Alternatives B and C (about 69 percent of total harvested acres) would use uneven-aged or intermediate thinning methods, thus a portion of existing stored carbon would remain in residual trees. Additionally, of the overall even-aged regenerating harvests proposed, all but 21 acres would use the shelterwood method where a portion of overstory trees would be retained. Even the small number of acres proposed using the clearcut method would retain residual reserve trees. Further, harvest treatments would improve poor quality stand conditions and increase forest resistance to drought, insects and disease, or a combination of disturbance types that can reduce carbon storage and alter ecosystem functions (Millar et al. 2007, D'Amato et al. 2011).

The wood and fiber removed from the forest in Alternatives B and C would be transferred to the wood products sector for a variety of uses, each of which has different effects on carbon (Skog et al. 2014). Carbon can be stored in wood products for a variable length of time, depending on the commodity produced. Wood can be used in place of other materials that emit more GHGs, such as concrete, steel, and plastic (Gustavasson et al. 2006; Lippke et al. 2011; McKinley et al. 2011). Likewise, biomass can also be burned to produce heat or electrical energy, or converted to liquid transportation fuels that would otherwise come from fossil fuels. In fact, removing carbon from forests for human use can result in a lower net contribution of GHGs to the atmosphere than if the forest were not managed (McKinley et al. 2011; Bergman et al. 2014; Skog et al. 2014). The IPCC recognizes wood and fiber as a renewable resource that can provide lasting climate-related mitigation benefits that can increase over time with active management (IPCC 2000). Considering the production of harvested wood products in Alternatives B and C, the initial carbon emissions from the ecosystem to the atmosphere would be lessened immediately and completely reversed with time, possibly leading to a greater carbon benefit to the atmosphere (negative net emissions) compared with unharvested stands.

Timber sale activity incurred in the past 10 years from other projects some of which are ongoing or planned in the near future will harvest up to 35,528 acres or about 9 percent of forested lands on the Green Mountain National Forest11. Together with the Somerset project the total acres harvested would be about 11 percent of forested lands. The cumulative effects associated with reduced carbon storage from forest harvest would be considered minimal since the carbon removed would be replaced by regenerating trees over time and forested lands would remain a carbon sink.

Prescribed Fire

Some tree species and forest communities within New England are well-adapted to fire and in some cases may depend on it for survival and regeneration. Historical fire suppression and harvesting practices have allowed some fire-dependent forests in the eastern U.S, to become unnaturally dense and alter species composition and structure (Nowacki and Abrams 2008, Thomas-Van Gundy 2015). Carbon emissions associated with prescribed fires from duff, litter, and dead wood comprise carbon pools that would otherwise decay quickly over time, releasing carbon to the atmosphere even in the absence of fire. By

[11] Approved by the environmental assessments and associated decision notices for the Nordic (2006), Natural Turnpike (2008), Upper White River (2010), Dorest/Peru (2013), Gilmore (2015), South of Route 9 (2017), Robinson (2019) and Early Successional Habitat Creation (2019) projects.

reducing vegetative competition in the understory, the proposed prescribed burning following harvest would help establish oak habitat and increase the ability of harvested areas to regenerate more quickly. This would help to support forest health in a changing climate and reducing GHG emissions over the long-term.

Soil Carbon

Mineral soil is an important consideration for long-term carbon storage capacity in soils in most ecosystems. Timber harvesting generally results in a negligible amount of carbon loss from the mineral soils typically found in the United States, particularly when operations are designed in a way to minimize soil disturbance (Nave et al. 2010, McKinley et al. 2011). Although timber harvest and prescribed fire can also affect the carbon stored in the understory and forest floor organic layer consisting of debris in various stages of decomposition, the carbon loss would be negligible given it is not stable or long-lived and would be replaced within months to a few years. Specific to the Somerset project, all proposed timber harvest activities would adhere to Green Mountain National Forest Land and Resource Management Plan standards and guidelines including compliance with Vermont Acceptable Management Practices (USDA Forest Service 2006, VANR 2018) and project specific mitigation measures designed to protect the soil resource and minimize disturbance (Somerset project EA, Appendix B). Additionally, all harvest treatment methods proposed would retain varying levels of standing residual trees and on-site logging slash providing a continual source of soil carbon as they decompose (Somerset project EA, Appendix A2).

Climate Change

Climate change is a global phenomenon, because major GHGs12 mix well throughout the planet's lower atmosphere (IPCC 2013). Considering emissions of GHGs in 2010 were estimated at 13,336 ± 1,227 teragrams13 carbon globally (IPCC 2014) and 1,881 teragrams carbon nationally (US EPA 2015), both Alternatives B and C make an extremely small direct contribution to overall emissions. Because local GHG emissions mix readily into the global pool of GHGs, it is difficult and highly uncertain to ascertain the indirect effects of emissions from single or multiple projects of this size on global climate. Therefore, at the global and national scales, the direct and indirect contribution from both Alternatives B and C to GHGs and climate change would be negligible. In addition, because the direct and indirect effects would be negligible, Alternative B and C's contribution to cumulative effects on global GHGs and climate change would also be negligible. Lastly, any initial carbon emissions during the implementation of Alternatives B or C would have a temporary influence on atmospheric carbon concentrations, because carbon will be removed from the atmosphere as forests regrow, minimizing or mitigating any potential cumulative effects.

From 2000 to 2009, forestry and other land uses contributed 12 percent of the human-caused global CO2 emissions14 (IPCC 2014). The forestry sector's contribution to GHG emissions has declined over the last decade (IPCC 2014; Smith et al. 2014; FAOSTAT 2013). The largest source of GHG emissions in the forestry sector globally is deforestation (e.g., conversion of forest land to agricultural or developed landscapes) (Pan et al., 2011; Houghton et al. 2012; IPCC 2014). However, forest land in the United States has had a net increase since the year 2000, and this trend is expected to continue for at least another decade (Wear et al. 2013; USDA Forest Service 2016). The proposed activities in Alternatives B and C

[12] Major greenhouse gases released as a result of human activity include carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons, and perfluorocarbons.

[13] This report uses carbon mass, not CO_2 mass, because carbon is a standard unit and can easily be converted to any other unit. To convert carbon mass to CO_2 mass, multiply by 3.67 to account for the mass of the oxygen (O_2).

[14] Fluxes from forestry and other land use (FOLU) activities are dominated by CO_2 emissions. Non-CO_2 greenhouse gas emissions from FOLU are small and mostly due to peat degradation releasing methane and were not included in this estimate.

will not result in the loss of forest land from the Green Mountain National Forest. In fact, forest stands are being treated to maintain a vigorous condition that supports enhanced tree growth and productivity, reduces the risk of insect and disease, and supports sustainable ecosystems thus contributing to long-term carbon uptake and storage.

Some assessments suggest that the effects of climate change in some United States forests may cause shifts in forest composition and productivity or prevent forests from fully recovering after severe disturbance (Anderson-Teixeira et al. 2013), thus impeding their ability to take up and store carbon15 and retain other ecosystem functions and services. Climate change is likely already increasing the frequency and extent of droughts, fires, and insect outbreaks, which can influence forest carbon cycling (Kurz et al. 2008; Allen et al. 2010; Joyce et al. 2014). In fact, reducing stand density, one of the goals of the Somerset project proposal, is consistent with adaptation practices to increase resilience of forests to climate-related environmental changes (Joyce et al. 2014). Both Alternative B and C are consistent with options proposed by the IPCC for minimizing the impacts of climate change on forests, thus meeting objectives for both adapting to climate change and mitigating GHG emissions (McKinley et al. 2011).

Summary

Both Alternative B and C affect a relatively small amount of forest land and carbon on the Green Mountain National Forest and might temporarily contribute an extremely small quantity of GHG emissions relative to national and global emissions. Alternative B or C would not convert forest land to other non-forest uses, thus allowing any carbon initially emitted from proposed activities to have a temporary influence on atmospheric GHG concentrations, because carbon would be removed from the atmosphere over time as the forest regrows. Furthermore, the proposed project would transfer carbon in the harvested wood to the product sector, where it may be stored for up to several decades and substitute for more emission intensive materials or fuels. Both Alternatives B and C are consistent with internationally recognized climate change adaptation and mitigation practices.

[15] The term "carbon" is used in this context to refer to CO_2.

4. Agencies and Persons Consulted

The following agencies, organizations and persons were consulted during the development the proposed action and/or environmental analysis for the Somerset project.

Agency, Organization or Name	Level of Involvement
Central Connecticut State University Paul Hapeman, wildlife biologist	Discussions to provide protection of American marten habitat
Christopher Crafts, local logger and resident	Provided a history of logging and led field trips for Forest Service timber staff in the project area
Great River Hydro Brandon Kibbe, land manager	Provided management history and future plans for Great River Hydro lands
Jed Bingham, local resident	Provided information regarding the potential for impacts to black bear habitat
New Hampshire Audubon Richard Foye and Carol Foss	Provided consultation regarding rusty blackbird habitat and surveys in the project area
Stockbridge Munsee Mohican Tribe	Discussions regarding heritage resource protection
USDA Forest Service Alexa Dugan and Duncan McKinley	Assisted with the carbon effects analysis
USDA Forest Service, Northern Research Station Richard McCullough, Forest Inventory and Analysis	Provided information on age class distribution on private lands within the project area
USDA Forest Service, Region 9 Melissa Simpson, Program Manager	Discussions regarding eligible Wild and Scenic Rivers
USDI Fish and Wildlife Service Susi von Oettingen	Provided guidance and information pertaining to northern long-eared bat protective measures
Vermont Association of Snow Travelers Matt Tereault	Discussions regarding protection of snowmobile trails
Vermont Fish and Wildlife Department Chris Bernier and Kim Royer	Discussions to provide protection of American marten habitat
Vermont Fish and Wildlife Department Eric Sorenson	Provided occurrence data of all threatened, endangered, proposed, and sensitive animal species; Discussions of prescribed burns in wetlands
Vermont Fish and Wildlife Department Jackie Comeau	Provided information regarding the potential for impacts to black bear habitat
Vermont Fish and Wildlife Department John Austin	Provided input regarding protection of northern long-eared bat and American marten habitat, and general discussions regarding early successional habitat
Vermont Fish and Wildlife Department Nick Fortin	Discussions regarding deer wintering areas
Vermont Natural Heritage Inventory	Provided the GIS layer of rare plant communities and the occurrence data for threatened, endangered and sensitive plant species
Vermont State Historic Preservation Office	Discussions regarding heritage resource protection
VT Department of Forests, Parks and Recreation Keith Thompson, private lands manager	Provided online records of harvesting on private lands within the project area
VT Department of Forests, Parks and Recreation Ethan Crumley	Provided information on management of state lands within the project area
VT Department of Public Safety Neil VanDyke	Review of safety, and search and rescue concerns associated with the proposed backcountry ski area

Agency, Organization or Name	Level of Involvement
VT Fish and Wildlife Department Aaron Marcus	Assisted with sensitive plant surveys and compilation of data collected
VT Fish and Wildlife Department Alyssa Bennett, Kerry Monahan, and Scott Darling	Discussions to develop protective measures for northern long-eared bat
Western Abenaki Tribes in Vermont Rich Holschuh, tribal liaison	Discussions regarding language to include to address Abenaki tribal cultural interests
Windham Regional Commission Chris Campany, Executive Director	Contacted for information regarding the potential for impacts to black bear habitat in Dover and Wardsboro
Windham Regional Planning Commission Jeff Nugent, GIS coordinator	Discussed recreation use numbers for trails within the project area

The following Forest Service employees participated in the analysis and/or preparation of the environmental documents as members of the interdisciplinary team or provided technical assistance and/or review of the Somerset project environmental assessment.

Name	Title	Area of Responsibility
David Francomb	District Ranger	Responsible Official
Martina Barnes	Acting District Ranger	Responsible Official (120-day assignment)
Brett Hillman	Wildlife Biologist	Wildlife including Threatened, Endangered, and Sensitive Species (transferred)
Phil Nyland	Wildlife Biologist	Wildlife including Threatened, Endangered, and Sensitive Species (120-day assignment)
Gretchen Nareff	Wildlife Biologist	Wildlife including Threatened, Endangered, and Sensitive Species
Suzanne Gifford	Wildlife Ecologist	Wildlife including Threatened, Endangered, and Sensitive Species; Ecology
Jay Strand	Forest NEPA Coordinator	Interdisciplinary Team Leader; NEPA; Carbon
Shawn Langston	NEPA Planner	NEPA; Wildlife including Threatened, Endangered, and Sensitive Species; Forest Habitat
Allan Braun	District Silviculturist	Timber; Silviculture
Jeff Tilley	Forestry Program Leader	Timber; Silviculture
Dan McKinley	Ecological Services Staff Officer	Fisheries; Water
Scott Wixsom	Biological Technician	Fisheries; Water
Angie Quintana	Forest Soil Scientist	Soil; Wetlands
MaryBeth Deller	Botanist	Botany including Sensitive Species and Non-Native Invasive Plants
Emily Lauderdale	Recreation Program Manager	Recreation; National Scenic Rivers; Visuals; Inventoried Roadless Areas; Wilderness
Andrew Triplett	Forest Archaeologist	Heritage Resources
Megan Krietsch	Archaeologist	Heritage Resources (120-day assignment)
David DiSanto	Assistant Fire Management Officer	Fire and Fuels
Brian Austin	Forest Engineer	Transportation (roads and infrastructure)
David Donahue	Civil Engineer	Transportation (roads and infrastructure)
Diane Burbank	Geographic Information System Specialist	Spatial Analysis; Maps; Forest Habitat
Jared Serpico	Forest Surveyor	Boundary Management (transferred)

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Appendix A1. Description of Harvest Treatment Groupings for Maps

There are seven different timber harvest treatment methods proposed for the Somerset project. Many stands have a combination of treatments proposed to achieve multiple objectives within a single stand. In these cases, there would be different portions of the same stand receiving different treatments. For example, a 60-acre stand may get a 30-acre shelterwood treatment in one part and a 30-acre group selection treatment in a different part. Given that there are seven different harvest methods proposed in 21 different combinations, they are grouped in the map legend for easier display and reading.

Table A1-1 provides the combination of harvest methods for each map legend group for Maps 2a-2d, Alternatives B and C Vegetation and Wildlife Habitat Management Activities. Specific harvest treatment methods proposed for each stand are provided in Appendix A2, Table A2-1.

Table A1-1. Description of harvest treatment groupings as displayed on project maps

Map Legend Group[1]	Silvicultural Method Group[2]	Harvest Method[3]
Even-age Regeneration	Even-aged Management	Clearcut
		Patch Cut
		Shelterwood
Even-age Regeneration/ Uneven-age Regeneration	Even-aged Management, Uneven-aged Management	Shelterwood – Group Selection
		Shelterwood – Group Selection with Improvement
		Shelterwood – Improvement Cut – Group Selection
		Shelterwood – Single Tree Selection with Groups
Even-age Regeneration/ Intermediate Treatment	Even-aged Management, Intermediate Management, Uneven-aged Management	Shelterwood – Thin – Group Selection
		Shelterwood – Thin
		Thin – Patch Cuts
Uneven-age Regeneration	Uneven-aged Management	Group Selection
		Group Selection with Improvement
		Single Tree Selection
		Singe Tree Selection – Group Selection
		Single Tree Selection with Groups
		Single Tree Selection – Group Selection with Improvement
Intermediate Treatment	Intermediate Management, Uneven-aged Management	Thin
		Thin – Group Selection
		Thin – Single Tree Selection
		Improvement Cut

[1] Legend group as it appears on Maps 2a-2d, Alternatives B and C Vegetation and Wildlife Habitat Management Activities
[2] Indicates the silvicultural system for each combination of harvest methods
[3] Displays how the 21 different combinations of harvest methods are grouped for each map legend included on Maps 2a-2d

Appendix A2. Proposed Timber Treatments

This appendix provides the harvest treatment method and timber stand improvement proposed under Alternatives B and C for each Compartment and Stand within the Management Areas where timber management is allowed in the Somerset project area (Tables A2-1 and A2-2).

Many stands have more than one silvicultural treatment proposed. In this case, each treatment would be implemented in different parts of the stand where conditions are found to be most appropriate. Forest inventory data is not accurate enough to draw meaningful lines between different treatment areas; this is best done when more time can be spent on the ground in each individual stand. In most cases, determining exactly where each individual treatment would occur would happen at time of timber sale layout. For this reason, approximate acres of each treatment proposed is provided, but could vary slightly during implementation. Also note that the sum of the stands listed for each treatment will be greater than the number of stands in the project due to more than one treatment being proposed in many stands.

Uneven-aged Management

There is a total of **5,689 acres and 5,236 acres of uneven-aged harvest treatments proposed for Alternatives B and C, respectively**. An uneven-aged system is a silvicultural system designed to simultaneously maintain: a) continuous high-forest cover, b) recurring regeneration of desirable tree species, and c) orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting methods that develop and maintain uneven-aged stands are single tree selection and group selection.

- **344 acres (16 stands) and 319 acres (15 stands) of single tree selection for Alternatives B and C, respectively**. In fifteen of the stands the desired regeneration would be sugar maple, and in one stand the desired regeneration would be hemlock. Red spruce would also be promoted where it exists in these stands. This harvest method removes selected single trees and groups of several trees at a time. Basal area (BA[16]) would be reduced to about 70 to 80 square feet per acre. Groups could range from one quarter-acre to two-acres in size, and be applied to 10 to 20 percent of the stand area. Smaller groups would be used to promote red spruce regeneration, while larger groups would be used to increase light to the forest floor to regenerate areas dominated by diseased beech regeneration.

  This treatment would produce sawtimber and pulpwood products, and reduce overall stocking of trees to appropriate levels for small amounts of sunlight to reach the forest floor. This would favor mostly regeneration of shade tolerant species of trees in the understory such as sugar maple, hemlock, spruce, and fir; and create a stand of trees of different sizes and ages. Note that in stands with high amounts of diseased beech understory, single tree selection is not an appropriate treatment as it would allow the beech to claim the site and prevent establishment of desirable shade tolerant species such as sugar maple.

- **3,325 acres (100 stands) and 3,131 acres (96 stands) of Group Selection with Improvement for Alternatives B and C, respectively**. This harvest method removes less desirable trees of any species in a stand, primarily to improve composition and quality. Groups could range from one quarter-acre to two-acres in size, and be applied to 10 to 20 percent of the stand area. Smaller groups would be used to promote red spruce regeneration, while larger groups would be used to increase light to the forest floor to regenerate areas dominated by diseased beech regeneration.

[16] The cross-section area of a tree stem including bark, in square feet, and commonly measured at breast height (4.5 feet above ground). This parameter is often used in silvicultural equations and/or models for determining growth and yield of forest stands.

- **2,200 acres (80 stands) and 1,786 acres (72 stands) of group selection for Alternatives B and C, respectively** (note that this total does not include groups embedded in single tree selection or improvement treatments). With this harvest method, trees are removed and new age classes are established only in groups. Groups could range from one quarter-acre to two-acres in size, and be applied to 10 to 20 percent of the stand area. Smaller groups would be used to promote red spruce regeneration, while larger groups would be used to increase light to the forest floor to regenerate areas dominated by diseased beech regeneration.

Even-aged Management

There is a total of **3,609 acres and 3,379 acres of even-aged regeneration treatments proposed for Alternatives B and C, respectively.** An even-aged system is a silvicultural system that produces stands in which all trees are about the same age; that is, the difference in age between trees forming the main crown canopy level will usually not exceed 20 percent of the rotation length. Intermediate treatments such as thinning and improvement are listed under even-aged management. This does not mean these stands would be required to be regenerated using even-aged methods in the future. However, the Forest Plan lists intermediate treatments as even-aged management, so they are being presented as such here to maintain consistency (Forest Plan, pages 24 and 25).

Intermediate Management

There is a total of **759 acres and 663 acres of intermediate harvest treatments proposed for Alternatives B and C, respectively.** An intermediate treatment is the removal of trees from a stand sometime between the beginning of formation of the stand and the regeneration treatment to start a new stand. Types of intermediate treatments include thinning, release, and improvement.

- **750 acres (23 stands) and 654 acres (20 stands) of thinning for Alternatives B and C, respectively would be conducted** by removing individual trees to provide increased growing space to improve growth on retained trees and enhance forest health through salvage of some dying trees. The BA would be reduced to about 60 to 70 square feet per acre in hardwood-dominated stands, and up to about 100 to 110 square feet per acre for conifer-dominated stands.

- **9 acres (1 stand) of improvement** would be conducted (note that this does not include acres that are proposed for improve with groups treatment). This harvest method removes less desirable trees of any species in a stand, primarily to improve composition and quality. The BA would be reduced to about 60 to 70 square feet per acre.

Even-aged Regeneration

There is a total of **2,850 acres and 2,716 acres of even-aged regeneration harvest treatments proposed for Alternatives B and C, respectively**. Types of treatments include shelterwood, clearcuts and patch clearcuts.

- **2,829 acres (102 stands) and 2,695 acres (95 stands) of shelterwood for Alternatives B and C, respectively**. Some large stands would have multiple shelterwood openings implemented. As a result, there are 136 total temporary openings proposed. Shelterwood harvests regenerate low quality stands and mature stands that are declining in productivity. Shelterwood is also the preferred treatment for regenerating oak. Shelterwood treatment could include up to three separate entries: 1) an optional preparatory cut to enhance conditions for seed production, 2) an establishment cut to increase light to the forest floor, prepare the seed bed, and to create a new age class, and 3) a removal cut to release established regeneration from competition with the overstory.

The majority of shelterwood treatments in the Somerset project area would only implement the establishment cut, with the retained trees generally being wildlife trees or smaller trees that would continue to mature through the life of the new stand (silviculturally this is considered a two-aged shelterwood variant, however, the Forest Plan considers any shelterwood to be even-aged, Forest Plan, page 24). Shelterwood treatments would be separated from other even-aged regeneration harvest by a forested manageable stand of at least ten acres in size with trees at least 15 feet tall (Forest Plan, Chapter 2, Section 2.3.5 Openings, Guideline G-3, page 26).

- **21 acres of clearcuts/patch clearcuts for both Alternatives B and C** would be conducted in three stands. One stand of off-site red pine would be clearcut and converted to oak/white pine. The other two stands have patches of aspen that would be regenerated through patch clearcuts of about two to five acres size each. The clearcut stands would have most trees removed, however, uncut patches totaling five percent of the harvested area would be retained (Forest Plan, Chapter 2, Section 2.3.7 Wildlife Reserve Trees - General, Standard S-1, page 27). Individual wildlife trees outside of the uncut patches would also be retained. Clearcut treatments would be separated from other even-aged regeneration harvest by a forested manageable stand of at least ten acres in size with trees at least 15 feet tall (Forest Plan, Chapter 2, Section 2.3.5 Openings, Guideline G-3, page 26).

Table A2-1. Proposed timber harvest treatments for Alternatives B and C

Stand	Acres	Forest Type Goal	Harvest Method	Harvest Acres (Alt. B/Alt. C)	Management Area
Compartment 84					
8	9	Mixedwood	Single Tree Selection-Group Selection	6/6	Remote Wildlife
9	15	Mixedwood	Thin-Single Tree Selection	14/14	Remote Wildlife
10	12	Softwood	Shelterwood	10/10	Remote Wildlife
11	24	Mixedwood	Single Tree Selection-Group Selection	15/15	Remote Wildlife
12	23	Hardwood	Shelterwood	13/13	Remote Wildlife
Compartment 96					
12	30	Mixedwood	Group Selection with Improvement	16/10	Diverse Backcountry
13	5	Mixedwood	Group Selection with Improvement	3/3	Diverse Backcountry
15	22	Mixedwood	Shelterwood	19/15	Diverse Backcountry
16	12	Softwood	Thinning-Group Selection	5/5	Diverse Backcountry
17	52	Mixedwood	Group Selection	45/45	Diverse Backcountry
19	14	Mixedwood	Group Selection with Improvement	6/5	Eligible Wild, Scenic, and Recreational River-Scenic, Diverse Forest Use
33	20	Mixedwood	Group Selection with Improvement	18/16	Diverse Backcountry
34	49	Mixedwood	Shelterwood- Group Selection	33/33	Eligible Wild, Scenic, and Recreational River-Scenic (15 acres), Diverse Forest Use
35	35	Mixedwood	Group Selection	33/33	Diverse Forest Use
36	59	Mixedwood	Group Selection	59/59	Eligible Wild, Scenic, and Recreational River-Scenic (<1 acre), Diverse Forest Use

Stand	Acres	Forest Type Goal	Harvest Method	Harvest Acres (Alt. B/Alt. C)	Management Area
37	26	Mixedwood	Shelterwood	26/26	Eligible Wild, Scenic, and Recreational River-Scenic (14 acres), Diverse Forest Use
38	19	Mixedwood	Group Selection	17/17	Diverse Forest Use
44	62	Mixedwood	Shelterwood; Thin-Group Selection	33/31	Diverse Forest Use
45	8	Mixedwood	Shelterwood	4/4	Diverse Forest Use
46	21	Mixedwood	Group Selection	12/12	Diverse Forest Use
47	31	Mixedwood	Shelterwood	20/19	Diverse Forest Use
51	11	Mixedwood	Group Selection with Improvement	9/9	Diverse Forest Use
52	42	Mixedwood	Shelterwood- Group Selection	39/39	Diverse Forest Use
53	13	Mixedwood	Group Selection	8/8	Diverse Forest Use
55	18	Mixedwood	Group Selection	6/6	Diverse Forest Use
Compartment 97					
9	73	Mixedwood	Thin- Group Selection	46/46	Diverse Backcountry
10	45	Mixedwood	Thin- Group Selection	35/35	Diverse Backcountry
14	55	Mixedwood	Shelterwood- Group Selection	53/53	Diverse Backcountry
Compartment 99					
1	25	N/A	Permanent Opening	21/21	Eligible Wild, Scenic, and Recreational River-Scenic, Diverse Forest Use
6	24	Mixedwood	Thinning	10/10	Diverse Forest Use
8	51	Mixedwood	Shelterwood- Group Selection with Improvement	43/43	Diverse Forest Use
10	50	Mixedwood	Group Selection with Improvement	43/43	Eligible Wild, Scenic, and Recreational River-Scenic (6 acres), Diverse Forest Use
12	52	Mixedwood	Group Selection with Improvement	49/49	Diverse Forest Use
14	17	Mixedwood	Shelterwood	16/16	Diverse Forest Use
15	40	Mixedwood	Group Selection with Improvement	33/33	Eligible Wild, Scenic, and Recreational River-Scenic (<1 acre), Diverse Forest Use
16	44	Mixedwood	Shelterwood- Group Selection with Improvement	44/44	Diverse Forest Use
18	16	Hardwood	Group Selection with Improvement	16/16	Diverse Forest Use
20	35	Mixedwood	Group Selection with Improvement	31/31	Diverse Forest Use
21	17	Mixedwood	Group Selection with Improvement	13/13	Diverse Forest Use
27	21	Mixedwood	Shelterwood- Group Selection with Improvement	19/19	Diverse Forest Use
28	17	Mixedwood	Shelterwood	14/14	Diverse Forest Use
29	32	Mixedwood	Group Selection with Improvement	31/31	Diverse Forest Use

Stand	Acres	Forest Type Goal	Harvest Method	Harvest Acres (Alt. B/Alt. C)	Management Area
30	16	Mixedwood	Shelterwood	11/11	Diverse Forest Use
31	17	Hardwood	Thinning	17/17	Diverse Forest Use
32	12	Hardwood	Group Selection with Improvement	11/11	Diverse Forest Use
33	10	Mixedwood	Group Selection with Improvement	1/1	Diverse Forest Use
34	34	Mixedwood	Group Selection with Improvement	26/26	Diverse Forest Use
35	31	Mixedwood	Group Selection with Improvement	31/31	Diverse Forest Use
36	15	Mixedwood	Group Selection with Improvement	14/14	Diverse Forest Use
43	2	N/A	Permanent Opening Creation	1/1	Diverse Forest Use
44	42	Mixedwood	Group Selection with Improvement	32/0	Diverse Forest Use
47	3	N/A	Permanent Opening Creation	1/1	Diverse Forest Use
Compartment 101					
2	108	Mixedwood	Group Selection with Improvement	67/67	Eligible Wild, Scenic, and Recreational River-Scenic (14 acres), Diverse Backcountry
7	57	Mixedwood	Shelterwood- Group Selection	46/46	Diverse Backcountry
10	62	Mixedwood	Shelterwood- Group Selection	58/58	Eligible Wild, Scenic, and Recreational River-Scenic (3 acres), Diverse Backcountry
27	86	Mixedwood	Group Selection	49/0	Diverse Backcountry
33	19	Mixedwood	Shelterwood	18/18	Eligible Wild, Scenic, and Recreational River-Scenic (9 acres), Diverse Backcountry
35	33	Mixedwood	Shelterwood-Single Tree Selection with Groups	28/28	Eligible Wild, Scenic, and Recreational River-Scenic, Diverse Backcountry
Compartment 102					
2	70	Mixedwood	Group Selection with Improvement	70/70	Eligible Wild, Scenic, and Recreational River-Scenic, Diverse Forest Use
3	42	Mixedwood	Shelterwood- Group Selection with Improvement	42/42	Eligible Wild, Scenic, and Recreational River-Scenic (30 acres), Diverse Forest Use
4	24	Mixedwood	Shelterwood	24/24	Eligible Wild, Scenic, and Recreational River-Scenic (6 acres), Diverse Forest Use
5	6	Mixedwood	Group Selection with Improvement	6/6	Diverse Forest Use
6	50	Mixedwood	Group Selection with Improvement	50/50	Eligible Wild, Scenic, and Recreational River-Scenic (17 acres), Diverse Forest Use
8	34	Mixedwood	Group Selection with Improvement	34/34	Diverse Forest Use
10	78	Mixedwood	Permanent Opening	58/58	Eligible Wild, Scenic, and Recreational River-Scenic (33 acres), Diverse Forest Use

Stand	Acres	Forest Type Goal	Harvest Method	Harvest Acres (Alt. B/Alt. C)	Management Area
11	32	Mixedwood	Thin-Group Selection	26/26	Eligible Wild, Scenic, and Recreational River-Scenic (24 acres), Diverse Forest Use
15	80	Mixedwood	Group Selection with Improvement	80/80	Diverse Forest Use
16	41	Hardwood	Group Selection with Improvement	28/28	Diverse Forest Use
17	35	Mixedwood	Shelterwood- Group Selection with Improvement	35/35	Diverse Forest Use
18	43	Mixedwood	Group Selection with Improvement	41/41	Diverse Forest Use
18a		Aspen	Patch Cut	2/2	Diverse Forest Use
19	29	Mixedwood	Shelterwood- Group Selection with Improvement	29/29	Diverse Forest Use
20	22	Mixedwood	Shelterwood	21/21	Diverse Forest Use
22	19	Mixedwood	Shelterwood	7/7	Diverse Forest Use
25	49	Mixedwood	Group Selection with Improvement	31/31	Diverse Forest Use
26	10	Mixedwood	Group Selection with Improvement	3/3	Diverse Forest Use
27	13	Mixedwood	Group Selection with Improvement	12/12	Diverse Forest Use
28	33	Mixedwood	Group Selection with Improvement	25/25	Diverse Forest Use
Compartment 103					
3	46	Mixedwood	Group Selection with Improvement	42/42	Diverse Backcountry
5	428	Mixedwood	Shelterwood-Group Selection with Improvement	389/377	Diverse Backcountry
7	26	Mixedwood	Shelterwood	20/20	Eligible Wild, Scenic, and Recreational River-Scenic (19 acres), Diverse Backcountry
Compartment 104					
5	15	Mixedwood	Shelterwood	14/14	Eligible Wild, Scenic, and Recreational River-Scenic, Diverse Forest Use
9	63	Mixedwood	Group Selection with Improvement	52/52	Eligible Wild, Scenic, and Recreational River-Scenic (9 acres), Diverse Forest Use
10	80	Mixedwood	Shelterwood-Group Selection with Improvement	80/80	Eligible Wild, Scenic, and Recreational River-Scenic (10 acres), Diverse Forest Use
11	64	Mixedwood	Thin-Patch Cuts	36/36	Eligible Wild, Scenic, and Recreational River-Scenic (8 acres), Diverse Forest Use
11a	64	N/A	Permanent Opening	28/28	Eligible Wild, Scenic, and Recreational River-Scenic (3 acres), Diverse Forest Use
12	14	Mixedwood	Shelterwood	14/14	Diverse Forest Use

Stand	Acres	Forest Type Goal	Harvest Method	Harvest Acres (Alt. B/Alt. C)	Management Area
Compartment 105					
1	329	Hardwood	Shelterwood-Group Selection with Improvement	316/316	Remote Wildlife
2	51	Mixedwood	Group Selection with Improvement	46/46	Remote Wildlife
5	31	Hardwood	Group Selection	31/31	Remote Wildlife
7	45	Hardwood	Group Selection with Improvement	35/35	Remote Wildlife
8	17	Mixedwood	Group Selection	17/17	Remote Wildlife
9	22	Mixedwood	Group Selection	20/20	Remote Wildlife
Compartment 106					
2	106	Mixedwood	Shelterwood-Group Selection	106/106	Remote Wildlife
3	216	Mixedwood	Shelterwood-Improvement with Groups	211/116	Remote Wildlife
4	167	Hardwood	Improvement with Groups	164/164	Remote Wildlife
5	40	Mixedwood	Shelterwood-Group Selection	40/40	Remote Wildlife
Compartment 108					
1	169	Mixedwood	Shelterwood-Single Tree Selection with Groups	140/140	Eligible Wild, Scenic, and Recreational River-Scenic (76 acres), Diverse Forest Use
5	82	Mixedwood	Shelterwood-Group Selection with Improvement	81/81	Diverse Forest Use
7	19	Mixedwood	Group Selection with Improvement	18/18	Diverse Forest Use
8	23	Mixedwood	Group Selection with Improvement	22/22	Diverse Forest Use
9	29	Mixedwood	Group Selection with Improvement	29/29	Diverse Forest Use
10	33	Mixedwood	Group Selection with Improvement	33/33	Diverse Forest Use
11	28	Mixedwood	Shelterwood	28/28	Diverse Forest Use
12	130	Mixedwood	Group Selection with Improvement	120/120	Diverse Forest Use
13	27	Mixedwood	Group Selection with Improvement	27/27	Diverse Forest Use
14	123	Mixedwood	Shelterwood-Group Selection with Improvement	93/93	Diverse Forest Use
15	16	Hardwood	Group Selection with Improvement	16/16	Diverse Forest Use
16	19	Mixedwood	Shelterwood	19/19	Diverse Forest Use
23	22	Mixedwood	Shelterwood	22/22	Diverse Forest Use
24	19	Mixedwood	Group Selection with Improvement	19/19	Diverse Forest Use
26	146	Mixedwood	Group Selection with Improvement	73/72	Diverse Forest Use, Diverse Backcountry (4 acres)

Stand	Acres	Forest Type Goal	Harvest Method	Harvest Acres (Alt. B/Alt. C)	Management Area
26a		N/A	Permanent Opening Creation	20/20	Diverse Forest Use
29	18	Mixedwood	Group Selection with Improvement	16/16	Eligible Wild, Scenic, and Recreational River-Scenic, Diverse Forest Use
34	12	Mixedwood	Group Selection	12/12	Diverse Forest Use
35	21	Mixedwood	Shelterwood-Group Selection with Improvement	21/21	Diverse Forest Use
36	44	Mixedwood	Group Selection	43/43	Diverse Forest Use
37	4	Mixedwood	Shelterwood	4/4	Diverse Forest Use
38	20	Mixedwood	Shelterwood	19/19	Diverse Forest Use
39	20	Mixedwood	Shelterwood	8/8	Diverse Forest Use
40	66	Mixedwood	Group Selection	27/27	Diverse Forest Use
41	52	Hardwood	Shelterwood-Group Selection with Improvement	52/52	Diverse Forest Use
42	29	Mixedwood	Group Selection	29/29	Diverse Forest Use
43	13	Mixedwood	Group Selection	13/13	Diverse Forest Use
Compartment 109					
7	96	Mixedwood	Shelterwood - Thin - Group Selection	72/72	Diverse Forest Use
12	39	Mixedwood	Group Selection with Improvement	29/29	Diverse Forest Use
16	32	Mixedwood	Shelterwood-Group Selection with Improvement	18/18	Diverse Forest Use
31	20	Mixedwood	Group Selection with Improvement	11/11	Diverse Forest Use
32	54	Mixedwood	Thin - Group Selection	30/30	Diverse Forest Use
33	39	Mixedwood	Shelterwood	17/17	Diverse Forest Use
45a	29	N/A	Permanent Opening	23/23	Diverse Forest Use
45b	29	Hardwood	Group Selection	3/3	Diverse Forest Use
46	18	Mixedwood	Group Selection with Improvement	9/0	Diverse Forest Use
49	117	Mixedwood	Shelterwood - Thin - Group Selection	73/69	Diverse Forest Use
Compartment 111					
1	51	Mixedwood	Shelterwood-Group Selection	46/46	Diverse Forest Use
2	62	Mixedwood	Shelterwood-Group Selection with Improvement	53/51	Diverse Forest Use
3	11	Mixedwood	Group Selection with Improvement	9/9	Diverse Forest Use
5	38	Mixedwood	Shelterwood-Group Selection with Improvement	33/33	Diverse Forest Use
6	23	Mixedwood	Shelterwood	18/18	Diverse Forest Use
9	115	Mixedwood	Shelterwood-Group Selection	97/97	Diverse Forest Use

Stand	Acres	Forest Type Goal	Harvest Method	Harvest Acres (Alt. B/Alt. C)	Management Area
11	39	Hardwood	Single Tree Selection with Groups	37/37	Diverse Forest Use
12	75	Mixedwood	Shelterwood-Group Selection	69/69	Diverse Forest Use
13	32	Mixedwood	Group Selection	32/32	Diverse Forest Use
15	18	Mixedwood	Shelterwood	17/17	Diverse Forest Use
17	13	Mixedwood	Group Selection with Improvement	13/13	Diverse Forest Use
18	66	Mixedwood	Shelterwood-Group Selection	66/66	Diverse Forest Use
19	110	Hardwood	Group Selection	110/110	Diverse Forest Use
20	23	Hardwood	Group Selection	23/23	Diverse Forest Use
22	59	Mixedwood	Shelterwood-Group Selection	57/57	Diverse Forest Use
23	52	Mixedwood	Group Selection	52/52	Diverse Forest Use
24	72	Hardwood	Single Tree-Group Selection with Improvement	72/72	Diverse Forest Use
25	58	Hardwood	Shelterwood-Group Selection with Improvement	52/52	Diverse Forest Use
26	14	Softwood	Group Selection with Improvement	14/0	Diverse Forest Use
29	12	N/A	Permanent Opening Expansion	12/12	Diverse Forest Use
30a	35	N/A	Permanent Opening Expansion	16/16	Diverse Forest Use
30b	35	Mixedwood	Shelterwood	18/18	Diverse Forest Use
31	26	Mixedwood	Shelterwood-Improve Cut with Groups	20/20	Diverse Forest Use
34	9	Mixedwood	Shelterwood	6/6	Diverse Forest Use
49	16	Mixedwood	Shelterwood	15/15	Diverse Forest Use
52	9	Mixedwood	Shelterwood	4/0	Diverse Forest Use
53	16	Mixedwood	Group Selection	11/0	Diverse Forest Use
55	15	Mixedwood	Group Selection	15/15	Diverse Forest Use
56	5	Mixedwood	Group Selection with Improvement	3/3	Diverse Forest Use
61	49	Mixedwood	Shelterwood-Group Selection	47/47	Diverse Forest Use
66	18	Mixedwood	Group Selection	12/0	Diverse Forest Use
68	13	Mixedwood	Shelterwood	13/13	Diverse Forest Use
70	37	Softwood	Group Selection with Improvement	20/20	Diverse Forest Use
76	22	Mixedwood	Group Selection	19/19	Diverse Forest Use
82	5	Mixedwood	Single Tree Selection	4/4	Diverse Forest Use
Compartment 112					
2	10	Hardwood	Group Selection with Improvement	10/10	Diverse Forest Use
4	35	Hardwood	Group Selection	35/35	Diverse Forest Use
13	154	Hardwood	Shelterwood-Group Selection with Improvement	153/153	Diverse Forest Use

Stand	Acres	Forest Type Goal	Harvest Method	Harvest Acres (Alt. B/Alt. C)	Management Area
14	76	Mixedwood	Shelterwood-Group Selection	75/75	Diverse Forest Use
15	38	Mixedwood	Group Selection	38/38	Diverse Forest Use
18	27	Hardwood	Group Selection with Improvement	27/27	Diverse Forest Use
23	85	Hardwood	Shelterwood-Group Selection with Improvement	85/85	Diverse Forest Use
25	46	Hardwood	Group Selection with Improvement	46/46	Diverse Forest Use
26	9	Hardwood	Improvement Cut	9/9	Diverse Forest Use
27	51	Mixedwood	Group Selection	51/51	Diverse Forest Use
30	19	Hardwood	Group Selection with Improvement	19/19	Diverse Forest Use
34	11	Mixedwood	Shelterwood	10/10	Diverse Forest Use
Compartment 113					
2	33	Mixedwood	Shelterwood	30/30	Diverse Forest Use
3	38	Hardwood	Single Tree Selection-Group Selection	36/36	Diverse Forest Use
4	13	Mixedwood	Group Selection with Improvement	13/13	Diverse Forest Use
5	45	Mixedwood	Shelterwood	27/19	Diverse Forest Use
6	50	Hardwood	Group Selection	48/48	Eligible Wild, Scenic, and Recreational River-Scenic (6 acres), Diverse Forest Use
8	16	Hardwood	Group Selection with Improvement	16/16	Diverse Forest Use
Compartment 116					
1	24	Hardwood	Single Tree Selection with Groups	22/22	Diverse Forest Use
2	63	Hardwood	Shelterwood-Group Selection with Improvement	63/63	Diverse Forest Use
3	22	Mixedwood	Shelterwood	22/22	Diverse Forest Use
4	24	Mixedwood	Group Selection with Improvement	22/22	Diverse Forest Use
5	9	Oak/Pine	Clearcut	9/9	Diverse Forest Use
6	42	Mixedwood	Group Selection	42/42	Diverse Forest Use
7	38	Hardwood	Group Selection	38/38	Diverse Forest Use
8	27	Hardwood	Single Tree Selection with Groups	27/27	Diverse Forest Use
9	31	Mixedwood	Group Selection	22/22	Diverse Forest Use
12	12	Mixedwood	Shelterwood	5/0	Diverse Forest Use
13	35	Mixedwood	Shelterwood	12/0	Diverse Forest Use
14	36	Mixedwood	Group Selection	12/10	Diverse Forest Use
16	19	Hardwood	Group Selection with Improvement	19/19	Diverse Forest Use
17	14	Hardwood	Group Selection with Improvement	14/14	Diverse Forest Use
18	48	Hardwood	Single Tree Selection with Groups	40/39	Diverse Forest Use

Stand	Acres	Forest Type Goal	Harvest Method	Harvest Acres (Alt. B/Alt. C)	Management Area
Compartment 118					
3	156	Mixedwood	Shelterwood-Group Selection with Improvement	154/154	Diverse Forest Use
6	96	Hardwood/Oak	Thin	68/68	Diverse Forest Use
8	43	Mixedwood	Group Selection	43/43	Diverse Forest Use
10	65	Mixedwood	Group Selection	65/65	Diverse Forest Use
10a	38	Mixedwood	Shelterwood-Group Selection/Shelterwood	38/27	Diverse Forest Use
14	64	Mixedwood	Thin-Group Selection	60/60	Diverse Forest Use
Compartment 150					
2	31	Mixedwood	Thin	30/30	Diverse Forest Use
3	21	Mixedwood	Shelterwood	21/21	Diverse Forest Use
9	39	Mixedwood	Group Selection	29/17	Diverse Forest Use
10	111	Mixedwood	Shelterwood-Group Selection with Improvement	81/81	Diverse Forest Use
11	23	Mixedwood	Shelterwood	18/18	Diverse Forest Use
12	56	Mixedwood	Group Selection with Improvement	51/51	Diverse Forest Use
18	47	Mixedwood	Shelterwood-Group Selection	39/39	Diverse Forest Use
19	18	N/A	Permanent Opening Expansion	14/14	Diverse Forest Use
21	21	Mixedwood	Group Selection	20/20	Diverse Forest Use
23	31	N/A	Permanent Opening Expansion	30/30	Diverse Forest Use
24	57	Mixedwood	Group Selection with Improvement	31/26	Diverse Forest Use
25	22	Mixedwood	Shelterwood	13/0	Diverse Forest Use
28	15	Softwood	Shelterwood	8/0	Diverse Forest Use
32	22	Mixedwood	Thin-Group Selection	11/0	Diverse Forest Use
35	37	Mixedwood	Shelterwood	21/21	Diverse Forest Use
36	38	Mixedwood	Group Selection	37/37	Diverse Forest Use
37	13	Mixedwood	Group Selection with Improvement	12/12	Diverse Forest Use
Compartment 176					
4	32	Mixedwood	Group Selection	19/9	Remote Wildlife
5	160	Mixedwood	Shelterwood-Thin	157/157	Remote Wildlife
8	12	Mixedwood	Thin	12/12	Remote Wildlife
9	171	Softwood	Shelterwood-Thin-Group Selection	146/146	Eligible Wild, Scenic, and Recreational River-Recreational (36 acres), Remote Wildlife
10a		N/A	Permanent Opening Expansion	22/22	Remote Wildlife
10b	54	Oak/Mixedwood	Shelterwood-Group Selection	31/31	Eligible Wild, Scenic, and Recreational River-Recreational (6 acres), Remote Wildlife
11	21	Mixedwood	Shelterwood	21/21	Remote Wildlife
12	98	Mixedwood	Group Selection	95/0	Remote Wildlife

Stand	Acres	Forest Type Goal	Harvest Method	Harvest Acres (Alt. B/Alt. C)	Management Area
13	25	Hardwood	Shelterwood-Improve Cut-Group Selection	25/25	Remote Wildlife
14	43	Mixedwood	Shelterwood-Group Selection	43/43	Eligible Wild, Scenic, and Recreational River-Recreational (28 acres), Remote Wildlife
15	47	Softwood	Single Tree Selection	24/0	Eligible Wild, Scenic, and Recreational River-Recreational, Remote Wildlife
16	23	Mixedwood	Group Selection	23/0	Eligible Wild, Scenic, and Recreational River-Recreational, Remote Wildlife
18	34	Mixedwood	Shelterwood-Group Selection with Improvement	26/26	Eligible Wild, Scenic, and Recreational River-Recreational (20 acres), Remote Wildlife
19	72	Mixedwood	Shelterwood-Group Selection with Improvement	55/0	Remote Wildlife
21	88	Mixedwood	Shelterwood-Thin-Group Selection	73/0	Eligible Wild, Scenic, and Recreational River-Recreational (<1 acre), Remote Wildlife
27	10	Mixedwood	Group Selection	8/0	Remote Wildlife
28	117	Mixedwood	Shelterwood-Group Selection	75/71	Remote Wildlife
31	188	Mixedwood	Group Selection	185/185	Eligible Wild, Scenic, and Recreational River-Recreational (19 acres), Remote Wildlife
32	17	Mixedwood	Thin	16/16	Remote Wildlife
37	66	Mixedwood	Thin-Group Selection	41/0	Remote Wildlife
Compartment 183					
1	76	Oak/Hardwood	Shelterwood-Group Selection with Improvement	75/75	Diverse Forest Use
2	50	Oak/Mixedwood	Shelterwood-Group Selection with Improvement	50/50	Diverse Forest Use
3	23	Hardwood	Single Tree Selection with Groups	23/23	Diverse Forest Use
4	12	Mixedwood	Single Tree Selection with Groups	12/12	Diverse Forest Use
5	37	Mixedwood	Single Tree Selection with Groups	33/33	Diverse Forest Use
6	21	Mixedwood	Thin-Group Selection	18/14	Diverse Forest Use
7	21	Oak/Hardwood	Shelterwood	21/21	Diverse Forest Use
8	35	Hardwood	Group Selection with Improvement	35/35	Diverse Forest Use
9	56	Mixedwood	Shelterwood-Group Selection with Improvement	56/56	Diverse Forest Use
10	23	Oak/Mixedwood	Shelterwood-Group Selection with Improvement	23/23	Diverse Forest Use
11	22	Mixedwood	Group Selection with Improvement	22/22	Diverse Forest Use

Stand	Acres	Forest Type Goal	Harvest Method	Harvest Acres (Alt. B/Alt. C)	Management Area
12	13	Oak/Mixedwood	Shelterwood-Group Selection with Improvement	12/12	Diverse Forest Use
			Total Stand Acres:	***11,065***	
			Total Harvest Acres:	***9,544/8,861***	

Table A2-2. Proposed timber stand improvement for Alternatives B and C

Compartment 96			
Stand	**Treatment Acres**	**Forest Type**	**Treatment Method**
22	41	Hardwood	Crop tree release
24	49	Hardwood	Crop tree release
28	31	Hardwood	Crop tree release
30	25	Hardwood	Crop tree release
Compartment 99			
22	27	Hardwood	Crop tree release
23	17	Softwood	Crop tree release
24	29	Hardwood	Crop tree release
37	13	Hardwood	Crop tree release
38	15	Hardwood	Crop tree release
Compartment 101			
9	22	Hardwood	Crop tree release
Compartment 105			
3	16	Hardwood	Crop tree release
Compartment 108			
3	13	Hardwood	Crop tree release
4	31	Hardwood	Crop tree release
Compartment 112			
12	24	Hardwood	Crop tree release
Compartment 118			
1	23	Hardwood	Crop tree release
4	11	Hardwood	Crop tree release
9	26	Hardwood	Crop tree release
Total acres	***413***		

Appendix A3. Proposed Wildlife Habitat Treatments

This appendix displays proposed non-timber harvest treatments that primarily benefit wildlife habitat in the Somerset project area. There are no differences between Alternatives B and C.

New and Expanded Permanent Upland Openings (Land Clearing and Maintenance)

Proposed land clearing to create new or expand existing permanent upland openings, and conduct periodic maintenance as needed over a 10-year period to retain early successional habitat conditions (see Table A3-1; also included in Table A2-1: Proposed Timber Treatments). Maintenance would be conducted by mechanical mowing or mastication; cutting with chainsaws, brush saws, or hand tools; prescribed burning; or a combination of these treatment methods.

Table A3-1. Proposed maintenance of new permanent and expansion of upland openings

Compartment	Stand	Acres	Treatment Acres	Additional Information
99	1	25	21	Create upland opening
99	43	2	1	Create upland opening
99	47	3	1	Create upland opening
102	10	78	58	Create upland opening
104	11a	64	28	Create upland opening
108	26a	146	20	Create upland opening
109	45	29	23	Create upland opening
111	29	12	12	Expansion of existing upland opening
111	30a	35	16	Expansion of existing upland opening
150	19	18	14	Expansion of existing upland opening
150	23	31	30	Expansion of existing upland opening
176	10a	54	22	Expansion of existing upland opening
Total Acres		***441***	***246***	

Existing Permanent Upland Opening Maintenance

Conduct periodic maintenance of existing permanent upland openings as needed over a 10-year period to retain early successional habitat conditions (see Table A3-2). Maintenance would be conducted by mechanical mowing or mastication; cutting with chainsaws, brush saws, or hand tools; prescribed burning; or a combination of these treatment methods.

Table A3-2. Proposed maintenance of existing permanent upland openings

Compartment	Stand	Treatment Acres
93	107	25
99	107	2
99	108	1
103	101	12
103	103	2
103	106	7
104	101	21
104	102	23
104	103	15
104	104	9
108	104	5
108	105	50

Compartment	Stand	Treatment Acres
108	110	6
109	103	8
109	108	67
110	106	7
111	109	53
111	127	1
111	128	10
118	101	5
146	101	5
150	101	3
150	104	15
150	109	2
176	102	4
176	103	11
Total Treatment Acres		***369***

Maintain Apple Trees

Release and prune apple trees throughout the project area (see Table A3-3). Maintain groups and individual apple trees by hand pruning branches and/or cutting woody vegetation to release them to open sunlight.

Table A3-3. Proposed release and pruning of apple trees

Compartment	Stand	Total Acres	Treatment Acres
84	10	12	2
99	47	3	2
102	10	78	2
102	107	4	2
104	11	64	2
104	102	23	2
104	103	15	2
108	29	18	2
108	104	5	2
Total Treatment Acres			***18***

Appendix B. Mitigation Measures

The Green Mountain National Forest Land and Resource Management Plan (Forest Plan) established Forest-wide and Management Area standards and guidelines to mitigate potential adverse effects of management activities (Forest Plan, Chapter 2, Section 2.3; and Chapter 3). The Somerset project has been designed to be consistent with all Forest Plan standards and guidelines. Mitigation measures have also been developed specifically for the Somerset project to address resource concerns beyond those addressed by Forest Plan standards and guidelines. Listed below are mitigation measures categorized by proposed activity or resource area. There are no differences for Alternatives B and C unless noted.

Glyphosate Application

1. Storage and pouring of herbicides from one container to another will take place outside the protective strip defined by forest-wide standards and guidelines (Forest Plan, Table 2.3-1, page 20). The protective strip will apply to all waters including streams, lakes, wetlands, springs, and seasonal pools.
2. All herbicide application will follow specimen label directions and state and federal laws.
3. Do not use R-11 surfactant (Wilbur-Ellis Co.) with glyphosate product applications to reduce risks to fish and aquatic invertebrates.
4. Within the surface water protective strip, including wetlands, limit glyphosate product application rate to 1.25 pounds acid equivalent per acre using only aquatic formulations.
5. When treatment areas are co-located with trails or developed recreation sites, temporary signs providing herbicide use information will be posted providing trail and recreation site users adequate warning of hazardous or potentially hazardous glyphosate application conditions.

Forest Habitat and Vegetation

1. Retain healthy black cherry trees with robust crowns having little or no economic value for wildlife purposes at a level appropriate to individual stand prescriptions.
2. Bole-only harvest will occur except in permanent wildlife opening creation treatment areas.
3. In uneven-aged harvest treatment units, retain at least five trees per acre for American marten habitat including mast trees and other large-diameter trees. Where feasible, reserved tress will be distributed throughout the interior and periphery of the harvest unit.
4. In clearcut and shelterwood treatment units, reserve uncut tree patches totaling five percent of the harvest area. Centered on designated wildlife reserve trees, reserve patches will be delineated as protected areas. In the reserve patches, retain as many trees as possible fitting individual stand prescriptions.
5. Avoid disturbing, crushing, or moving coarse woody material to the extent feasible during operations.

Non-native Invasive Plants

Wildlife habitat treatments

1. For new upland openings, ensure the adjacent roadside or trailside has been surveyed for non-native invasive plants. If any infestations are identified, use the risk assessment protocol (USDA Forest Service 2003) to determine actions needed.

2. For new upland openings in Compartment 102/Stand 10 and Compartment 104/Stand 11a, apply the following mitigation measures where adjacent roadsides are infested with wild parsnip:
    a. Access the stand in a shaded area where wild parsnip is absent, or if that is not feasible, treat the wild parsnip in the growing season prior to accessing the stand. Once treated, cover the treated access point with weed fabric and cover with a few inches of gravel.
    b. Maintain a 100-foot wooded buffer between the infestations and new upland openings.
    c. Use mastication and prescribed fire to maintain these openings. Once initially masticated, maintain with prescribed fire if possible, to eliminate potential of equipment spreading wild parsnip seeds.
    d. Annually monitor and treat wild parsnip at these openings.
3. For proposed upland opening expansions, complete botanical survey to determine whether non-native invasive plants are present in the existing opening with the potential to spread into upland opening expansion areas. If any are found, use the risk assessment protocol (USDA Forest Service 2003) to determine actions needed.
4. Consult with the Forest botanist prior to fire line construction to determine whether there are any known non-native invasive plants to avoid or treat.

Timber harvest treatments

5. Monitor for three years post-implementation newly created temporary roads used for vegetation management activities. Treat new infestations wherever feasible.
6. For a shelterwood, clearcut, or patch-cut stands, or where vegetation management will involve group cuts ranging from one quarter to two acres in size, maintain a buffer of at least 100 feet between vegetation management activities and permanent roads unless adjacent road edge is un-infested.
7. Complete a non-native invasive plant inventory prior to using or constructing log landings or temporary log landing access roads. For locations with infestations, either do not use, relocate, or if their risk rating for the proposed activity is low to moderate according to standardized risk rating protocols (USDA Forest Service 2003), work with the Forest botanist to develop suitable treatment methods approved in the Invasive Plant Control Environmental Assessment Decision Notice and Supplemental Information Report (USDA Forest Service 2011; and USDA Forest Service 2014).
8. At regeneration harvest sites in Compartment 111/Stands 6 and 15, resurvey the stands to determine whether 2006 mapped garlic mustard and wild chervil infestations in the campground are present and overlap with proposed activities.
    a. If infestations are present, consider dropping proposed activities unless control is feasible.
    b. If control is feasible, treatments must occur prior to harvest activities and in winter over frozen or snow-covered ground to minimize further seed spread.
    c. Prior to accessing infested areas, harvest activities must occur in un-infested areas.

Visual quality

9. At Shep's Meadow on Forest Road 71, either do not access the site through existing wild parsnip infestations or treat the parsnip prior to entering the site to prevent spread into the meadow.

Aquatic, soil and wetlands

10. Where large woody debris will be placed for fish habitat improvement, avoid accessing the site through, or working within, known infestations of non-native invasive plants (site-specific data are available from the Forest botanist). For sites without a botanical inventory, implementers must learn potential non-native invasive plant identification and avoid identified non-native plants, or they must consult Forest botany staff for further instruction.
11. Where soil and wetland improvement activities will occur, complete a botanical inventory prior to project implementation. Follow the risk assessment protocol (USDA Forest Service 2003) to determine how to mitigate concerns where infestations overlap proposed project work.

General

12. For timber haul system road reconstruction sites or other project sites requiring gravel placement, botany staff will complete invasive plants monitoring prior to placement. If weed-free gravel is not used, monitor sites for three years after gravel placement. If new infestations are found, treat using methods approved in the Invasive Plant Control Environmental Assessment Decision Notice and Supplemental Information Report (USDA Forest Service 2011; and USDA Forest Service 2014). Since there is no weed-free gravel certification in Vermont, weed-free refers to gravel made by crushing inert material (rock).
13. Prior to wheeled or tracked equipment use, the equipment must be cleaned to ensure no plant propagules or mud containing them is moved onto National Forest System land. This mitigation measure does not apply to logging trucks or personal work vehicles used only for log landing access.
14. In locations where seed mixes will be used including those used for pollinator habitat enhancement, consult with the Forest botanist to ensure the species in the mix are locally native not just native to North America. Where erosion is a concern, non-native, non-persistent species may be used upon Forest botanist consultation.

Threatened, Endangered and Sensitive Wildlife Species

Northern long-eared bat

1. Avoid cutting or destroying known, occupied northern long-eared bat maternity roost trees unless they are an immediate safety hazard.
2. Cutting of trees over four inches diameter breast height is prohibited from April 1 through July 31.
3. Where summer harvests (August 1 through August 31) are planned, conduct additional bat surveys in May, June, and/or July preceding the planned harvests. If northern long-eared bats are detected, the harvests will be postponed until after August 31.
4. If a pregnant female northern long-eared bat is captured, harvests would not occur from April 1 through August 31 within a one-mile buffer of the capture location, and harvests which reduce canopy cover below 60 percent would be limited to 20 percent of the area (400 acres) within the one-mile buffer.
5. Cutting trees over four inches diameter at breast height is prohibited from April 1 through October 31 within a one-mile radius of the Dover Iron Mine.
6. Tree removal greater than four inches diameter at breast height for ski trails in backcountry ski zones will not occur from April 1 through August 31.

Northern long-eared, eastern small-footed, little brown, and tri-colored bats

7. Designate bat occupied caves and mines as smoke-sensitive targets. Avoid smoke entering these caves and mines any time of the year when threatened, endangered, or sensitive bats are present.
8. Do not apply herbicide within 150 feet of known maternity roosts from June 1 through August 31.
9. Survey old buildings, wells, cisterns, bridges, and other man-made structures for bat prior to structural modification or demolition. If roosting threatened, endangered, or sensitive bats are found, demolition or modification of these structures will not occur when bats are present and the need for alternative roosts will be evaluated.

Bicknell's thrush

10. Vegetation removal over 2,800 feet elevation for ski trails in backcountry ski zones will not occur from June 1 through August 15.
11. Skiable line placement will be prioritized within hardwood stands in order to avoid early-successional, high-density balsam fir areas.

Wood turtle

12. If possible, avoid project work from May 1 through July 15 in the riparian zone along the Deerfield River.

Monarch

13. When using cut-stump herbicide, avoid inadvertently treating milkweed which provides food and shelter to monarchs.

Sensitive Plant Species (Listed as a Regional Forester Sensitive Species) and Natural Communities

1. To prevent dwarf mistletoe (*Arceuthobium pusillum*) loss, do not cut black spruce trees unless it is determined parasitic dwarf mistletoe does not occur on them. This possibility is greatest in wet microsites where large woody debris work is done.
2. To prevent loss of sensitive plant species associated with maintained openings (such as leathery grapefern [*Botrychium multifidum*], whorled milkwort [*Polygala verticillata*], pointed blue-eyed grass [*Sisyrinchium angustifolium*], and eastern blue-eyed grass [*S. atlanticum*]), botany staff should inventory each opening without one completed. If any of these species are found, implementers should work with the Forest botanist to develop a site-specific openings maintenance plan that would be least harmful to the species found.
3. To avoid sensitive plant species harm in Compartment 176/Stand 104 where upland opening maintenance is proposed, develop a site plan with botany staff. Sensitive plant species known to occur in this stand include Wiegand's sedge (*Carex wiegandii*), possibly dwarf mistletoe (*Arceuthobium pusillum*); and historical occurrence of few-seeded sedge (*C. oligosperma*).
4. Develop an access route to Compartment 150/Stand 10 where vegetation management is proposed to avoid rare plants in Compartment 176/Stand 104.
5. Do not trample or change habitat for long-bract green orchis (*Dactylis viridis*) which occurs in Compartment 111 on the boundary between Stands 61 and 22. A site plan for not changing habitat may be developed on the ground in the next growing season by working with the Forest botanist.
6. To protect butternut (*Juglans cinerea*), do not cut healthy butternut encountered during project implementation activities.

7. To protect eastern blue-eyed grass (*Sisyrinchium atlanticum*) in Compartment 150/Stand 104, work with the Forest botanist to develop an opening maintenance site plan. Consider avoiding fall dropseed muhly (*Muhlenbergia uniflora*) and Hayden's sedge (*Carex haydenii*) listed as sensitive plants by the state of Vermont.
8. To protect rare aquatic plants at Grout Pond including American shore-grass (*Littorella americana*), snail-seed pondweed (*Potamogeton bicupulatus*), Torrey's bulrush (*Schoenoplectus torreyi*), northeastern bladderwort (*Utricularia resupinata*), site shoreline activities to minimize rare plant impacts.
9. During implementation, avoid trampling the one known large roundleaf orchid (*Platanthera orbiculata*) near Grout Pond.
10. Maintain a 50-foot wide no harvest or mechanical activity buffer zone along the west side of TH 14 (Grout Pond Road) running north along Compartment 176/Stand 104 starting from the northern boundary of the existing opening to protect the black spruce woodland bog natural community adjacent to the east. Prescribed fire for opening maintenance would be allowed within the buffer.

Soil and Wetlands

Vegetation management activities

The following mitigation measures are applicable to ground disturbing vegetation management activities, such as commercial timber harvests and non-commercial vegetation treatments. These are in addition to timber sale contract provisions for protection of soil and water quality:

1. Sale area layout will exclude all wetlands, poorly and very poorly drained soils, and shallow soils (less than 20 inches deep over bedrock), greater than one-quarter acre in area, unless ground conditions are conducive for minimizing effects to acceptable levels per agreement by Forest timber staff and soil scientist.
2. Site specific ground-inventory (including shovel testing) will be conducted under the guidance of the Forest soil scientist within proposed timber harvest stands and landings prior to layout where very poorly or poorly drained or shallow soils are mapped to verify soil drainage class.
    a. Tables B-1 and B-2 list the proposed treatment stands and log landings with very poorly or poorly drained soils or shallow soils mapped requiring field review and clearance before layout under the guidance of the Forest soil scientist:

Table B-1. Stands with poorly drained soils and proposed log landings with somewhat poorly drained or poorly drained soils[1]

Compartment	Stand(s)	Compartment	Stand(s)
96	12, 34, 35, 44, 46	108	1, 9, 10, 11, 12, 13, 14, 15, 16, 23, 26, 40, 43
97	10	109	7, 16, 32, 33, 45
99	15, 28, 29, 44	111	1, 2, 5, 6, 9, 12, 15, 24, 26, 31, 53, 55, 61, 66, 68, 70, 76, 82
101	2, 7, 27	112	4, 13, 14, 23, 30, 34
102	4, 10, 11	113	4, 5
103	5, 7	116	4
104	11	150	24
105	1, 2	17	5, 9, 37
106	4		

Compartment	Stand(s)	Compartment	Stand(s)
Harvest Zone	**Log Landing(s)**		
HZ15	L1		
HZ21	L18, L19		
HZ28	L1, L3		
HZ29	L2		

[1] Identified by Natural Resource Conservation Service, National Soil Information System database (NRCS 2019)

Table B-2. Stands with shallow soils[1]

Compartment	Stand(s)
118	3, 6
183	1, 9

[1] Identified by Natural Resource Conservation Service, National Soil Information System database (NRCS 2019)

3. Identify the extent of wetlands within harvest units and temporary road locations.
   a. Establish 100-foot wetland buffer areas in harvest units.
   b. Any requests to operate equipment or implement management activities within the 100-foot buffer of wetlands will be reviewed by the Forest soil scientist, ecologist, wildlife biologist, and botanist prior to layout.
   c. Notify the specialist assigned to wetland resources prior to preparation of system or temporary roads within wetlands to ensure compliance with Vermont Wetland Rules prohibiting road expansion over 20 percent width and importing fill.
4. Vegetation treatments in stands over 2,500 feet in elevation may be considered on a case-by-case basis with review by the Forest soil scientist. Stands with areas over 2,500 feet elevation are listed in Table B-3.

Table B-3. Stands with areas over 2,500-foot elevation (* indicates when not included for Alternative C)

Compartment	Stands
84	9, 10, 11
96	19, 34, 35
105	5, 7, 8, 9
106	2, 3
116	9, 12*, 13*, 14

5. Bole-only harvest will occur in all stands except for permanent wildlife opening creation treatment areas.
6. Sale area layout will exclude slopes over 45 percent. Equipment operations on slopes 25 to 45 percent may be considered on a case-by-case basis with Forest timber sale administration and soil scientist concurrence.
7. Winter Harvest: Operating condition requirements include 12 inches of frozen/compacted snow, five inches of frozen soil, or conditions preventing excessive impacts to soils (rutting, soil displacement/mixing, compaction, or erosion).

8. Summer (Dry Season) Harvest: Summer operations can occur when soils are sufficiently dry to minimize rutting and compaction and temporary road locations have been approved by the Forest timber sale administrator and soil scientist.

   a. Table B-4 identifies the stands approved for summer (dry season) harvest.

   b. Table B-5 identifies temporary roads where poorly drained soils and wetlands have been mapped and/or field verified. If temporary roads not yet surveyed for soil and wetland concerns are proposed for summer harvest access, they will require site-specific ground inventory and Forest soil scientist concurrence prior to construction.

   c. Additional treatment stands may be identified and considered for summer (dry season) harvest if the conditions described above are met and approved by the Forest soil scientist. For additional treatment stands, skid roads and landings will be located outside of water body protective strips and poorly drained soils unless otherwise agreed to by the Forest soil scientist.

Table B-4. Stands suitable for potential summer timber harvest

Compartment	Stand(s)
96	33
97	9, 10 (if poorly drained soils are excluded)
99	12, 14, 16, 28, 43 (if haul road is constructed outside of wetland and buffer), 47
101	33
102	3, 4, 5
108	5, 7, 24, 34, 35, 39, 41, 43 (if haul road is constructed outside of wetland and buffer)
109	16, 33 (if poorly drained soils are excluded), 46
111	17, 19 (if haul road is constructed outside of wetland and buffer), 23
116	3, 4 (if poorly drained soils are excluded), 5, 6
183	2 (if areas with shallow soils are excluded)

Table B-5. Temporary roads with mapped and/or field verified wetland and poorly drained soil concerns (* indicates when not applicable for Alternative C)

Temporary Road	Soil and Wetland Concern(s)	Mitigation Measure
HZ1T1, HZ1T2	Poorly drained soil with stream running down road	Winter only Restore original road contour after use
HZ2T2, HZ2T3	Poorly drained soil, wetland buffer	Winter only
HZ6T2*	Within wetland buffer	Winter only Field verification required if Alternative B is selected
HZ7T2	Within wetland, poorly drained soil	Winter only Restore wetland hydrology after use
HZ7T3	Within wetland buffer	Winter only Do not use the segment that is now a perennial stream Use alternate route
HZ7T5	Poorly drained soil	Winter only
HZ8T1*	In wetland buffer, very poorly drained soil	Field verification required if Alternative B is selected
HZ10T1	In wetland buffer, poorly drained soil	Winter only
HZ11T1	Within stream protective strip	Field verification required before summer use
HZ12T1	Poorly drained soil	Winter only

Temporary Road	Soil and Wetland Concern(s)	Mitigation Measure
HZ14T2	Poorly drained soil and within wetland	Field verification required before summer use
HZ17T2*	Within wetland buffer	Field verification required if Alternative B is selected
HZ18T2	Within stream protective strip	Winter only
HZ21T3*	Within wetland buffer	Reroute required if Alternative B is selected
HZ21T7	Within wetland	Winter only Restore wetland hydrology after use
HZ25T1, HZ25T2	Within poorly drained soil and wetland buffer, with stream running down road	Winter only Recontour road after use
HZ25T3	Mapped in wetland, but adequate buffers were field verified	Summer acceptable No matter season of harvest, improve road drainage structures (culverts or waterbars) to reduce direct runoff into stream channel on both uphill stream approaches 0.2 miles east of HZ25L4 so they are adequately spaced from the stream before use to haul timber
HZ25T4	Within wetland buffer	Winter only
HZ27T1	Within wetland	Winter only
HZ28T1*	Poorly drained soil	Field verification required if Alternative B is selected
HZ29T1	Within wetland	Winter only
HZ29T2	Poorly drained soil and within wetland	Winter only Re-contour 800-foot abandoned section where possible, or install check dams where recontouring is not possible
HZ29T3	Poorly drained soil and within wetland	Winter only Install check dams along dugway on National Forest System land after use to stabilize against ongoing erosion and rebuild the roadbed

9. On Forest Road 328 restore drainage through wetland before, during, and after use for hauling timber using a combination of culverts and rolling dips.
10. Locate skid roads, skid trails, and landings to direct water flow outside of riparian corridors as quickly as possible, avoid steep terrain where possible (slopes above 30 percent), maximize distance between the road and water bodies, minimize number of water body crossings, and minimize total miles of skid road.
    a. Where possible, locate landings at least 100 feet from all wetlands, including seasonal pools, and design and manage them to not contribute sediment to any water body.
    b. Reduce logging debris (such as chips and bark) at landings to less than 12 inches so not to restrict vegetative growth.
    c. Scatter tops and limbs on landings and skid trails during logging operations where needed to reduce compaction and erosion, and return all other tops and limbs and scatter throughout harvested stands to retain soil nutrients.
11. The following mitigation measures apply to the construction of temporary roads:
    a. Seed and mulch bare soils immediately after construction, using rates and options described in Vermont Acceptable Management Practices (VANR 2018; VANR 2019a) as a minimum

guideline. Consult with the Forest botanist regarding seed mix composition, and either use locally native species or non-native but non-persistent species.

b. On exposed steep slopes in excess of 35 percent, place geotextile fabric, jute netting, or other erosion control matting as needed to hold soil and seed in place immediately after construction and maintain until vegetation is established.

c. Remove drainage structures and construction fill material from stream and wetland crossings to restore maximum water flow and floodplain and wetland function.

d. Use a geotextile fabric under gravel in areas over 200 feet long and remove gravel after use where needed to maintain natural forest hydrology and stabilize soils.

e. Following use of temporary roads, restore roadbed where site specifically needed to maintain natural stream and wetland hydrology and stabilize soils. This can include, but is not limited to, outsloping roadbeds, eliminating ditches, scarifying and decompacting graveled areas, restoring pre-project landscape contour, and reshaping streambanks.

Permanent wildlife opening creation, expansion, and maintenance

12. Do not allow heavy equipment stump removal or land-smoothing to prevent irreversible damage to soil structure, biota, and chemistry. Stands proposed for root wad removal are exempt from this mitigation measure.

Root wad removal for large wood placement

13. Confine root wad removal to Compartment 102/Stands 10 and 107 and Compartment 104/ Stand 11a where soil drainage and evidence of previous tillage was confirmed with shovel tests (map available in the planning record).

14. The following mitigation measures will minimize runoff, erosion, and sedimentation:

    a. Root wads will only be removed from the specific areas identified (map available in the planning record).

    b. Root wads will be harvested when soils are dry.

    c. If feasible, trees will be left where felled for a season so nutrient rich soil clinging to the roots is washed off the root wads and left onsite. Otherwise, all root wad trees will be shaken and/or scraped to remove as much soil as possible.

    d. Additional non-merchantable, small-diameter trees will be cut as needed to provide slash to cover exposed mineral soils to support equipment and minimize rutting and compaction.

    e. Skid trails will be confined to slopes less than 10 percent gradient wherever possible.

    f. Root wads will not be removed from within the protective strip of water bodies.

    g. Fine logging slash (smaller than one-inch diameter at breast height) will be spread outside the protective strip and within 150 feet of all waterbodies where soil is disturbed during root wad harvest to cover at least 70 percent of the bare soil.

        i. This will be completed at the end of each day unless earthwork continues in the area within the next 24 hours and there is no precipitation forecast for the next 24 hours.

        ii. All areas of disturbance will be stabilized with at least 70 percent ground cover within 48 hours of root wad removal.

h. Root wads will not be removed from more than 0.1 contiguous acres of land, will be separated by at least 100 feet of land excluded from root wad removal, and follow a patch/mosaic pattern.

i. If root wad removal spans successive years, the distance between root wad removal areas will be optimized to leave large amounts of undisturbed land between removal areas allowing previous root wad removal areas soil recovery time.

j. Where root wad removal occurs, all tops and limbs not removed for project use will be scattered throughout the stand.

k. After root wad removal, areas likely to concentrate runoff will be smoothed to disperse runoff in sheet flow. All skid trails will be covered with at least six inches of slash.

Aquatic restoration

15. Consult with the Forest soil scientist to designate a travel route for heavy equipment associated with aquatic organism passage construction, channel restoration and stabilization, and large wood placement. Heavy equipment will not operate on wetlands or their buffers, or poorly or very poorly drained soils, outside of what is necessary for project implementation

16. Following use, if soils are compacted more than four inches below the surface, de-compact the travel route to the depth of compaction, followed by seeding and mulching. Consult with the Forest botanist regarding seed mix composition and either use locally native species or non-native but non-persistent species.

Prescribed burning and associated activities:

17. Prescribed burning will only be done when overall mineral soil heating is low, and no more than an average loss of one inch or one-half of the sum of organic horizons will be consumed during burns.

    a. Mosaic and mixed-severity burn patterns are desirable to minimize immediate post-burn exposure of mineral soil. This will lessen soil erosion and nutrient losses.

    b. Avoid burning in areas dominated by outcrops and soils less than 12 inches deep over bedrock.

18. While burning piles:

    a. Allow sufficient time to dry/cure the piles to lower the risk of a smoldering fire and the potential for high soil heating.

    b. Minimize the number of piles at each burning site with a maximum of 10 percent of the unit area occupied by piles. Previous pile burning sites will be reused as much as possible to minimize soil nutrient losses in the unit.

19. Use natural barriers for fire lines when feasible, and hand crews for fire line construction if they can be constructed safely, to minimize potential compaction, rutting, erosion, and sedimentation.

20. No excavator equipment will be used to create fire line within the protective strips of streams, wetlands, ponds, or on slopes in excess of 25 percent without Forest soil scientist review and concurrence.

21. Mulch exposed mineral soil on fire lines where run-off and erosion may be an issue using onsite duff material after burning to minimize erosion and sedimentation.

22. On slopes in excess of 35 percent, install water bars during fire line construction (before burning). On slopes in excess of 20 percent, install water bars along the fire line after burning to minimize erosion.

23. Excavator equipment will only be used once in each stand over the life of the project for the creation of fire lines.
24. When equipment is used for fire line creation, minimize removal of mineral soil, to minimize erosion and sedimentation. To correct unintended soil disturbance and removal, mulch with onsite duff material or straw and install water bars.
25. When equipment is used for fire line creation, only remove the upper layers of organic matter, leaving the most decomposed organic matter layer intact to minimize erosion and sedimentation. To correct unintended soil disturbance and removal, mulch with nearby duff material or straw and install water bars.
26. To maintain existing wetland wildlife habitat and soil organic carbon levels, do not conduct prescribed burns or construct fire line within wetlands or their buffers without Forest ecologist and wildlife biologist review and concurrence.

Mountain bike trail construction and decommissioning:

27. Locations of new trails will be reviewed by the Forest soil scientist as flagged on the ground prior to trail construction to minimize the effects on wetlands or steep, shallow, or unstable soils along the trail.
28. New mountain bike trails will be constructed so that trail grade does not exceed half the grade of the hillside; overall trail grade should be 10 percent or less. They will also adhere to International Mountain Bicycling Association (IMBA) principles found in Trail Solutions: IMBA's Guide to Building Sweet Singletrack (IMBA 2004), and Managing Mountain Biking: IMBA's Guide to Providing Great Riding (IMBA 2007).
29. Bicycle use will be discouraged during mud season in spring by posting signs educating users about resource concerns and to minimize potential for compaction, rutting, and puddling during the most sensitive time of the year.
30. After reroutes are complete, manually rip the trail prism with hand tools to a depth of three to six inches to speed soil and plant recovery.
31. Trails will not be rerouted or constructed in wetlands or within their 100-foot buffer. Portions of decommissioned trail within wetlands will be abandoned to heal naturally.
32. In somewhat poorly drained soils, extra drainage features will be installed to ensure water is routed off the trail and onto an appropriately stable surface. Trails will be routed around poorly drained soils whenever feasible.

Recreation

Roads

1. Temporary traffic controls will be used to provide road users with adequate warning of hazardous or potentially hazardous conditions associated with timber harvesting operations. The timber sale purchasers and the Forest Service will agree to a specific traffic control plan for each sale prior to commencing operations to address safety concerns associated with recreation traffic.
2. Upon completion of harvest activities, road closure devices will be installed to prevent unauthorized motorized use in accordance with the following mitigation measures:
    a. The selection of a road closure device and closure procedures will follow the road access management guidelines for roads on the Green Mountain National Forest to discourage

unauthorized use and subsequent aquatic and soil resource impacts. Road closures can be conducted using berms, boulders, gates, or transplanting trees and shrubs from nearby or adjacent sites into the road surface area. Closure devices on roads used for recreation and other access will allow for openings to meet those uses.

b. Wherever practical, a closure device will be placed at the entrance of a network of roads rather than closing each individual segment.

Trails

3. The following mitigation measures will be implemented to protect trails, including continued safe use of the existing trail system.

   a. No trail will require permanent rerouting as a result of proposed vegetation management prior to or after project implementation. Temporary rerouting or trail closures may be an option selected when necessary for safety and when other options are not viable.

   b. Existing trails will be protected during harvest operations. Any damage to trails incidental to logging activities will be repaired in a timely manner. This includes repairing damage to waterbars, removal of slash and debris, smoothing of ruts in trails and removal of overhead hazards.

   c. Forest recreation staff will be consulted prior to sale closeout for trail tread, signage, and closure-device related planning.

   d. Skid road crossings on trails will be perpendicular to the trail tread wherever feasible and have a sight distance safe enough to allow visibility for recreation users.

   e. Skid roads that cross system trails will be disguised with retained organic material produced by logging activities. Prior to the completion of harvest activities, tree branches with diameters at breast height of six inches or less will be placed in a random, natural appearing pattern along the width of the road where it intersects the trail to a height of two to three feet and a depth of six to eight feet.

   f. Where feasible, trees will be felled away from the trail prism to reduce retained organic material accumulation immediately adjacent to the trail.

   g. When practical, plan timber harvests and road construction activities outside of the typical season of use of any trails or other recreation sites that may be impacted.

   h. If harvest activities occur along or within trails, logging activity signs will be posted, and the trails will be evaluated for temporary closure to ensure safety of forest visitors.

   i. Hauling activities impacting high-use snowmobile or cross-country ski trails will not take place on weekends or federal holidays unless snow conditions prohibit these recreation activities to occur. Recreation and timber staff will consult with local clubs during sale layout planning to determine use levels on trails and appropriate weekend haul restrictions.

   j. If harvest activities using snowmobile or cross-country ski trails for skidding or hauling are required by prescription to operate during the snowmobile season (December 16 through April 15) (used for ski season as well), attempts to accommodate both activities will be made.

      i. If conditions allow, adequate snow pack at a width that would allow snowmobile/ski passage will be left on one side of the trail and safety signs will be posted.

ii. Clearing roadside vegetation and filling and compacting snow in ditches to increase passing width on roads may be done to facilitate sharing.

iii. If simultaneous use of the trails is not possible, temporary reroutes of the snowmobile/ski trails will be considered.

iv. Coordination between Forest Service timber/recreation, Vermont Association of Snow Travelers, and Catamount Trail Association staff will occur before the winter season to allow time for the responsible clubs to designate alternative routes or complete closure of the route to mitigate safety concerns.

k. If feasible, timber sales will be sequenced to limit disruption of snowmobile trail network continuity and connections (particularly north/south) as much as possible.

Developed Recreation

4. Recreation staff will be consulted prior to harvest activities and opening creation/maintenance occurring adjacent to developed recreation sites or along access roads such as Grout Pond Road and Forest Road 71 through Somerset Airfield.

   a. A 100-foot buffer will be kept between treatments and Somerset Airfield Campground to reduce unintended expansion of camping impacts.

   b. Closure devices (gates or boulders) will be added to landings and openings' access points.

5. When harvest activities occur adjacent to developed recreation areas, logging activity signs will be posted.

Congressionally Designated Areas

6. Treatment units adjacent to wilderness will have boundaries marked and delineated to a degree of accuracy agreed upon by recreation and survey staff. No trees will be felled that can fall into wilderness.

7. Questions regarding the location of any wilderness area boundaries will be directed to the Forest land surveyor.

Scenery

8. In the proposed group selection, single tree selection with groups, and shelterwood with groups treatment units in Compartment 9/Stands 27, 28, 34, 35, and 36; Compartment 116/Stands 1, 2, 6, 7, 8, 14, and 18; and Compartment 118/Stands 3, 8, and 10:

   a. Limit size of group to less than one acre and locate in a linear shape with the contour where needed in consultation with a Forest Landscape Architect or recreation staff trained in scenery management so the harvest is minimally evident from the listed viewpoints.

9. Where clearcut treatments (including the creation of wildlife openings) and shelterwood treatments exceed 200 feet along trails (for clearcut and shelterwood units), 200 feet along roads (for clearcut units) and 400 feet along roads (for shelterwood units), mark the stand to leave a 1,000-foot buffer between openings and to create a visual buffer depth of 100 feet.

   a. Modifications to the buffer length and depth may be appropriate in some situations based on topography and forest type. These will be decided on a case-by-case basis in consultation with the Forest landscape architect or recreation planner trained in scenery management.

10. For all roads maintained for passenger vehicle travel, slash resulting from timber harvest within 15

feet of the road edge will be pulled back and then lopped and/or scattered. Beyond 15 feet, lop and scatter slash to a height no greater than two feet above the ground for a distance of 100 feet from the road's edge (unless local topography naturally mitigates visible slash).

11. A 50-foot buffer from the VT Route 9 road edge will be left in shelterwood and group selection units in Compartment 111/Stands 1 and 3.
12. For VT Route 9, beyond 15 feet, lop and scatter slash to a height no greater than two feet above ground for a distance of 150 feet from the road's edge (unless local topography naturally mitigates visible slash).
13. Where timber harvest takes place adjacent to residential homes and yards, lop and scatter remaining slash within 25 feet of the residential boundary and to within two feet from the ground.
14. Where feasible, screen log landings from view of Forest visitors on trails, roads and at developed recreation sites by using an angled road or leaving a vegetative screen. When possible, landings will be located out of sight from roads or public viewing locations.

Heritage

A draft Programmatic Agreement between the Green Mountain National Forest, Vermont State Historic Preservation Office, and Advisory Council on Historic Places is currently undergoing review and revision. It is the desire of all who are entering into this agreement to streamline procedural requirements and emphasize the common goal of protecting historic properties within National Forest System lands in Vermont. When the Programmatic Agreement is finalized and signed by all signatories, the heritage resource mitigation measures in this section may be modified, based on the final version of the Programmatic Agreement.

Until the Programmatic Agreement is finalized, all project-related fieldwork and reports will meet the standards set forth in the *Vermont Division for Historic Preservation's Guidelines for Conducting Archaeology in Vermont* (VDHP 2017). Therefore, for each years' proposed activities the Green Mountain National Forest will submit archaeological survey reports for review to the Vermont State Historic Preservation Office and consulted tribes. These reports will document the Forests' findings that the activities may not affect or may not adversely affect historic properties. Concurrence for these survey reports must occur prior to implementation of any project activity.

Although the following general mitigation measures are included to ensure protection of heritage sites, additional site-specific mitigation measures may be identified during consultation with the Vermont State Historic Preservation Office based on their review of submitted archaeological survey reports.

1. All heritage resource sites will have a buffer zone to protect the site from physical disturbance. This buffer zone may be customized to reflect the kind of site its associated features, location, and/or level of prior use and disturbance; and the nature of the proposed activity.
    a. In the absence of a customized buffer (or the inadvertent discovery of a site during project layout or implementation), the Vermont Division for Historic Preservation has determined that the default buffer is 200 feet in every direction. Alternately, customization may be implemented to harvest activities within the site area under circumstances that minimize disturbance and maximize benefit to the overall condition of the site. These types of measures are agreed to by the Forest Service Archaeologist and project proponent or Timber Sale Administrator.
2. Stone walls/fences will not be disturbed. However, with the Forest Archeologists' approval, exceptions may be made when there is a clear need to breach a wall (for example, to move between timber sale units).

3. The location and manner of proposed stone wall/fence breaches will be determined by the Forest Service Archaeologist in conjunction with the activity project proponent/program manager or Timber Sale Administrator for harvest activities.
4. In cases in which the origin of the stone walls/fences is potentially of Native American origin, the Western Abenaki groups of Vermont will be notified and included in any relevant decisions.
5. General mitigation measures for un-surveyed areas sensitive for the location of prehistoric Native American sites will be applied to ensure that disturbance to the subsurface soil horizon in which these sites do, or may, exist is avoided or minimized. General mitigation includes:
    a. Avoidance of the area altogether, and the use of alternative harvest technologies such as tracked feller-bunchers or helicopters.
    b. In the project area, some of the stands and areas where proposed activities will take place may require this treatment, but specific measures will be determined by the Forest Service Archaeologist as needed prior to and during implementation.
    c. Post-harvest monitoring will occur in areas in which tracked feller-bunchers harvest techniques were used to determine if this mitigation measure was adequate. Modifications to this mitigation measure may occur, based on monitoring results.
6. Specific locations of newly proposed temporary haul roads and skid roads requiring disturbance below the ground surface, such as clearing and grading, will be coordinated with the Forest Service Archaeologist prior to implementation to ensure heritage resources are avoided. A map showing the buffered area for protected heritage resources in these areas will be provided to appropriate personnel prior to any approved project implementation.
7. All heritage resource sites that are eligible for the National Register of Historic Places (NRHP), or whose NRHP statues remains unevaluated, will be protected from any ground disturbance. These sites will be avoided by all project activities and will be protected by a buffer zone of up to 100 feet beyond the site boundary. No vegetation removal or other activities will be allowed within this zone.
8. Forest Service staff and contractors must immediately stop work if any unexpected artifacts, archaeological sites, or human remains are encountered; and the location will be reported to the Forest Archaeologist.

Appendix C. Existing National Forest Trail System

Table C1-1 provides the existing National Forest Trail System within the Somerset project area.

Table C1-1. Existing National Forest Trail System

Trail Number	Name	Miles	Designed* and Managed Uses
1	Appalachian Trail / Long Trail	16.41	Hike
307	Top of the Mountain	2.40	Snowmobile
326	Deerfield Ridge	6.34	Hike
326A	Binney Brook	0.55	Hike
326B	Haystack Mountain	0.31	Hike
327	Valley C100	0.28	Snowmobile
373	Kelley Stand Road	0.43	Snowmobile
374	Fayville	0.23	Snowmobile
375	Glastenbury	8.45	Bike, Horse, Snowmobile*
376	Glastenbury Cross-over	1.52	Bike, Horse, Snowmobile*
377	East Deerfield Loop	3.52	Snowmobile
378	Somerset/Dover Connect C7/100	9.04	Snowmobile*, Cross-Country Ski
379	Deerfield River	3.12	Snowmobile
380	Sports Cabin	0.32	Snowmobile
381	Castle Brook	7.92	Bike, Horse, Snowmobile*
382	Pine Valley	2.11	Bike, Horse, Snowmobile*
383	South Mountain	3.92	Snowmobile
384	Woodford Powerline	2.18	Snowmobile
384.02	Adams Connector	0.39	Snowmobile
385	Corridor 7	18.64	Bike, Hike, Horse, Snowmobile*, Cross-Country Ski
386	Little Pond	2.48	Bike, Hike, Horse*, Snowmobile
387	Woodford Mall Trail	0.64	Snowmobile
388	Red Mill Access	1.31	Bike, Horse, Snowmobile*
389	Castle Meadow (Corridor 7)	1.25	Bike, Horse, Snowmobile*
419	Grout Pond Loop	2.66	Hike*, Cross-Country Ski
420	Grout Pond Camp	0.70	Hike*, Cross-Country Ski
421	Grout Pond Hill Top	0.84	Hike*, Cross-Country Ski
422	Grout Pond East	3.21	Cross-Country Ski
422.01	Grout Pond East Trail Access	0.02	Cross-Country Ski
422.02	Grout Pond East Connector	0.06	Cross-Country Ski
423	Grout Pond West	1.37	Cross-Country Ski
430	East Branch	5.25	Hike*, Cross-Country Ski
436	West Ridge	0.10	Hike
449	Little Pond Access	0.33	Hike
453	Little Pond Access Spur AT/LT	0.06	Hike
460	Glastenbury River	1.05	Bike, Horse*
508	Winhall River	0.01	Cross-Country Ski
	Total Miles	**109.42**	

Appendix D. Existing National Forest Transportation System

Table D1-1 provides the existing National Forest Transportation (Road) System within the Somerset project area by maintenance level.

Road Operational Maintenance Level Descriptions

Maintenance Level 1 (OML 1). Assigned to intermittent service roads during the time they are closed to vehicular traffic. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level. Emphasis is normally given to maintaining drainage facilities and runoff patterns.

Maintenance Level 2 (OML 2). Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses.

Maintenance Level 3 (OML 3). Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads are typically low speed, single lane with turnouts and spot surfacing or fully surfaced with either native or processed material.

Maintenance Level 4 (OML 4). Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. Some roads may be single lane and some may be paved and/or dust abated.

Maintenance Level 5 (OML 5). Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated.

Table D1-1. Existing National Forest Transportation System by maintenance level

Road No.	Road Name	Beginning Mile Post	Ending Mile Post	Length in Miles
OPERATIONAL MAINTENANCE LEVEL 1				
72A	Red Mill Spur	0	0.304	0.30
72C	Red Mill Spur	0	0.263	0.26
84	Somerset South	0	0.37	0.37
268	Heather Brook	0.9	2.11	1.21
272	Pine Valley	0	1.23	1.23
324	Glastenbury River	0	0.3	0.30
325	Castle Brook	6.8	8.2	1.40
325A	Castle Brook Spur	0	0.1	0.10
325B	Castle Brook Spur	0	0.6	0.60
326	Rake Branch	0	0.68	0.68
328	Short Stretch	0	0.58	0.58
332	Billings Pond	0	0.36	0.36
339	Railroad Grade	0	0.7	0.70
340	Shep Meadow	0	0.1	0.10
371	Deer Cabin Brook	0	1.6	1.60
372	Deer Lick Brook	0	0.8	0.80

Road No.	Road Name	Beginning Mile Post	Ending Mile Post	Length in Miles
373	Blind Brook	0	1.9	1.90
373A	Blind Brook Spur	0	0.5	0.50
374	Nichols Camp	0	0.4	0.40
375	Kid Gore	0	0.7	0.70
376	Castle Meadow	0	1.5	1.50
383	Stratton Mountain Camp	0	1.5	1.50
384	South Black Brook	0	0.6	0.60
			Total for OML 1 Miles	***17.70***
OPERATIONAL MAINTENANCE LEVEL 2				
86	Smith Woods	0	0.96	0.96
268	Heather Brook	0	0.9	0.90
275	Little Pond	0	1.6	1.60
325	Castle Brook	0	6.8	6.80
			Total for OML 2 Miles	***10.26***
OPERATIONAL MAINTENANCE LEVEL 3				
72	Red Mill	0	0.83	0.83
83	Flood Dam	0	1.3	1.30
290	Pine Valley Parking	0	0.1	0.10
386	Kelley Stand East Parking	0	0.14	0.14
			Total for OML 3 Miles	***2.37***
OPERATIONAL MAINTENANCE LEVEL 4				
71	Somerset	6.16	14.85	8.69
			Total for OML 4 Miles	***8.69***
			Grand Total Road Miles	***39.02***